Dr. Jackson, of Boston, U. S.

in remembrance of friendly visits

by the Author

Richd. Owen

September, 1843.

IX. *On the Fossil Mammals of Australia.*—Part VI. Genus *Phascolomys*, Geoffr.

By Professor Owen, *F.R.S. &c.*

Received September 14,—Read December 7, 1871.

§ 1. *Introduction.*—In a paper "On the Osteology of the Marsupialia"* I noted the expansion of the base of the nasal bones in the genus *Phascolomys*, and the agreement of the Wombat in this character with the Koala, Phalangers, Petaurists, Myrmecobians, Dasyures, and Opossums; thus indicating, as far as observation then warranted, a general marsupial character of form in those bones.

In a second paper I entered upon a comparison of the nasal bones in *Phascolomys vombatus*, Geoff., and *Phasc. latifrons*, Owen, and showed that, in the latter species, "the nasal bones were relatively broader, forming the whole upper surface of the anterior third of the skull"†.

In the 'Descriptive Catalogue of the Osteological Series in the Museum of the Royal College of Surgeons of England,' another character was pointed out in "the superior breadth of the part of the maxillary ascending in front of the malar and lacrymal bones to join the nasals" in *Phascolomys latifrons*. "The greater relative breadth of the nasal bones, as compared with those of *Phascolomys vombatus*," was also noted among the characters differentiating a third species of existing Wombat defined in that work‡ as *Phascolomys platyrhinus*.

§ 2. *Nasal bones in* Phascolomys vombatus, *Pér.*—I now proceed to consider, as far as materials permit, the amount of variety to which the same species of Wombat may be subject in the nasal bones,—a requisite preliminary to determining the value of these bones in differentiating recent and fossil species of *Phascolomys*.

In an old male Tasmanian Wombat (*Phasc. vombatus*) the basal breadth equals two thirds of the length of the pair of nasal bones§. The outer angles of the nasals, at their base ($_{15}$), are divided from the lacrymal tubercle ($_{73}$) by a strip of maxillary ($_{21}$) 4 lines in breadth, joining to that extent the frontal ($_{11}$). The sides of the pair of nasals converge forward at the hinder third, then run parallel, gently curving inward, and finally gaining the margin of the nostril, with a slight curve outward. Thus the course of each lateral border of the nasals is undulate. Their tips ($_{15'}$) extend forward

* Transactions of the Zoological Society, vol. ii. (1838) p. 387.

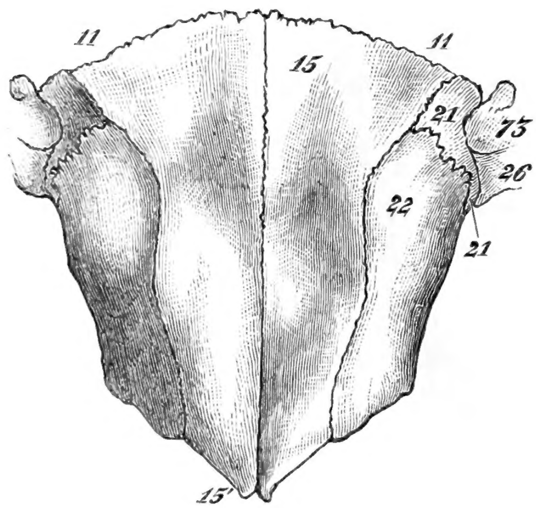
† Ib. vol. iii. (1845) p. 304, pl. xxxvii. figs. 1 & 4.

‡ 4to (1853), p. 334.

§ This proportion is expressed as follows by Dr. Murie in describing his specimen of *Phascolomys vombatus*:—"The proportional breadth of the two nasal bones at their hinder ends is to their length as 68 to 100." (Proc. Zool. Soc. 1867, p. 802.)

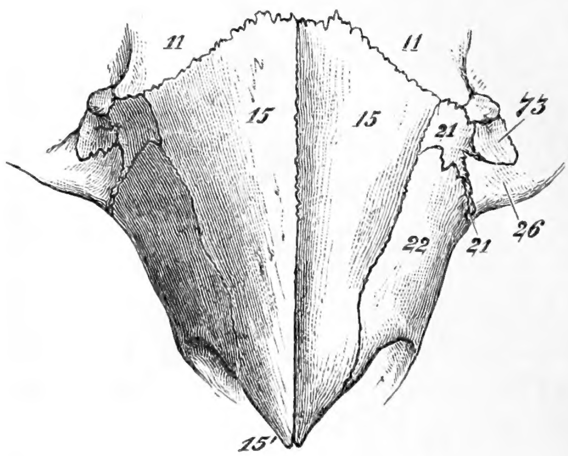
about three lines in advance of the naso-premaxillary suture, and are bevelled off to an obtuse point from without obliquely inward and forward. Together these bones form the middle third of the upper border of the external bony nostril. The frontals ($_{11}$) make a slight projection into the middle of the fronto-nasal suture, which from this shallow indent runs outward and a little forward to the nasal process of the maxillary ($_{21}$)*. The naso-maxillary suture forms the hind fifth part of the lateral border of the nasals; the naso-premaxillary suture runs along the rest of the extent of the nasal bones; *i. e.* to the beginning of their free ends, which are short and subobtuse.

Fig. 1.



Nasal bones and their connexions,
var. 2, *Phascolomys vombatus*, Geoffr.

Fig. 2.



Nasal bones and their connexions,
var. 3, *Phascolomys vombatus*, Geoffr.

In a second Tasmanian Wombat the nasals (fig. 1, $_{15}$) differ from those above described in their basal breadth, this being equal to rather more than three fourths of their length, or as 77 to 100, also in the absence of any mesial indent of the fronto-nasal suture, and in the sharper convergence forward of the hinder fourth part of the lateral margins. These margins describe a similar wavy course, convex outwards along the middle third, or a little in advance of it. The apices overhanging the nostril are less sharp and prominent than in the last or type specimen.

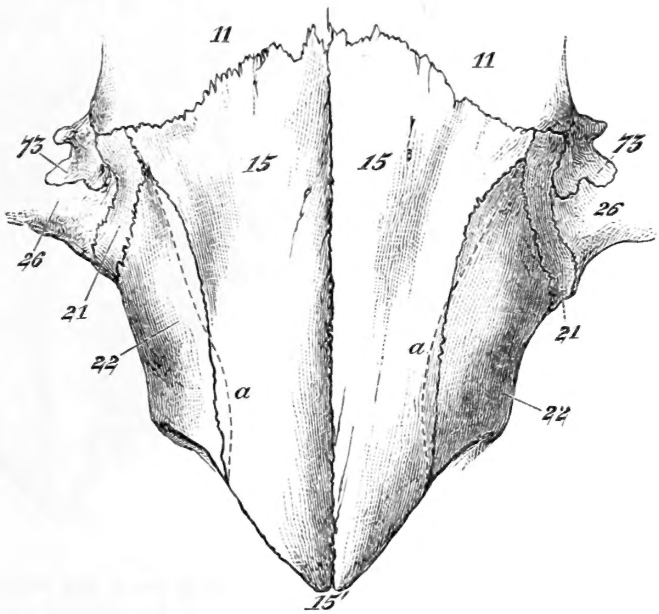
In a third younger *Phascolomys vombatus* (fig. 2) the lateral margins converge more gradually and in an almost straight line from the base to the anterior fourth of the nasals, where the margins extend nearly straight to the nostril. The middle sixth part of the fronto-nasal suture is slightly concave; the rest extends outward and more obliquely forward than in the two preceding specimens. The apices of the nasals projecting beyond the premaxillo-nasal sutures are sharp, and form one fifth the length

* This specimen, figured in my first paper (*loc. cit.*), shows the usual characters and is not here figured: the references to the numerical symbols of the bones, in aid of the description, are seen in the subjects of the two Woodcuts showing the varieties.

of the whole lateral margin of the bone. The basal breadth bears almost the same proportion to the length of the nasals as in the first cited skull.

§ 3. *Nasal bones in* Phascolomys platyrhinus, *Ow.*—The Platyrhine Wombat, in the absence of postorbital processes, the shortness of the naso-maxillary suture, and the deep emargination of the fore part of the nasal process of the premaxillary, is more nearly allied to *Phasc. vombatus* than either of these species are to *Phasc. latifrons**; but the nasal bones (fig. 3, $_{15}$) are relatively broader in the Platyrhine than the Tasmanian

Fig. 3.



Nasal bones and their connexions, *Phascolomys platyrhinus*, Ow.

Wombat, the outer basal angles approaching as near to the lacrymal tubercles (ib. $_{73}$) with a greater relative breadth of the skull at that part. In one skull the lateral borders of the nasals have the same undulatory course, but more feebly marked than in the second variety of *Phasc. vombatus* (fig. 1). In a second the suture between the nasals ($_{15}$) and premaxillaries ($_{22}$) runs as in fig. 3. There is a narrow and irregular intrusion of the frontal at the middle of the fronto-nasal suture, sometimes at the expense of the right (as in fig. 3), sometimes of the left nasal bone. The breadth of the base of both bones equals five sevenths of the length of the nasals in two specimens, and four fifths in a third. The apices ($_{15'}$), projecting anterior to the naso-premaxillary suture ($_{22'}$), are blunter than in the first variety of *Phascolomys vombatus*. The width or breadth of the nasals, at their base or fronto-nasal suture, begins to diminish at once, as they advance, by the converging course of the naso-maxillary ($_{15-21}$) and naso-pre-

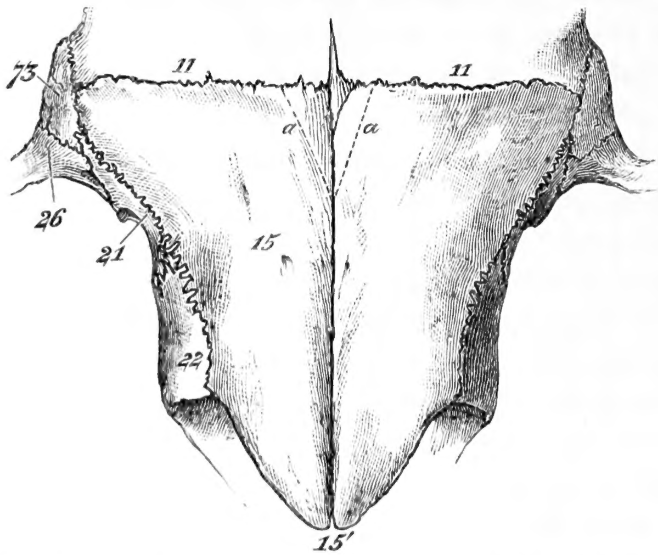
* This relation is pointed out by Dr. MURIE, who remarks:—"*Phascolomys latifrons* shears off from the common form of Wombat and reverts to the true marsupial type in several particulars" (*loc. cit.* p. 800). These, however, he does not cite; and I may have to note some points in which it seems rather to diverge from the common character.

maxillary ($_{15-22}$) sutures. In not any of the three specimens before me is "the width of the nasals continued forward beyond their middles"*. In one variety the course of the naso-premaxillary suture was such as is shown by the dotted line *a a* in figure 3. A broader strip of the maxillary ($_{21}$) divides the malar ($_{26}$) from the premaxillary ($_{22}$) in the present species than in *Phascolomys vombatus*. This is a good and constant character in a comparison of the two species.

§ 4. *Nasal bones in* Phascolomys latifrons, *Ow.*—The breadth of the fore part of the frontals in the Latifront or Hairy-nosed Wombat is made to contrast with the narrowness of the rest of the bones by the outward extension of the postorbital processes†; the nasals (fig. 4, $_{15}$) present a more regular triangular form, through the prevailing transverse course of the fronto-nasal suture ($_{11-15}$) and the more regular convergence of the lateral margins of the nasals to the fore ends of the naso-premaxillary sutures ($_{15-22}$). Beyond these the lateral margins of the nasals converge more rapidly to their apices ($_{15'}$), which extend freely further forward than in the two preceding species. The breadth of the nasals at the base of their free extremities is greater than in the bare-nosed Wombats, and the upper surface of the entire bones is flatter.

In one of the two skulls before me of *Phascolomys latifrons* the left frontal breaks the transverse course of the fronto-nasal suture by a sharp-pointed process or wedge between the two nasals (indicated by the upper line in fig. 4); in the second skull

Fig. 4.



Nasal bones and their connexions, *Phascolomys latifrons*, Ow.

the right frontal sends forward in the same way a more obtuse triangular process; in my type skull (Zool. Trans. vol. iii. pl. xxxvii. fig. 4) both frontals contribute equal shares to the wedge, which is longer (as shown by the lower dotted lines, *a*, *a*, in fig. 4).

* Murie, *loc. cit.* p. 803.

† Plate xxxvii. fig. 4, *o*, *o*, Zool. Trans. vol. iii. (1845) (nat. size); also Murie, Proceedings of the Zool. Soc. 1865, p. 844, fig. 1 (half nat. size).

Outside this, in all Latifront Wombats, the fronto-nasal suture runs straight outward to the lacrymal (73), from which bone it is not separated, as in *Phascolomys platyrhinus* and *Phasc. vombatus*, by the maxillary (21). The extent of the naso-maxillary suture (15–21) equals that of the naso-premaxillary suture (15–22).

These differences in the connexions of the nasals are more significant of specific distinction than the shape of the bones. The naso-maxillo-premaxillary suture (15–21–22) is very slightly concave outwardly in the Latifront Wombat; and the free border of the nasals beyond the suture affects a convex bend toward the apices.

§ 5. *Nasal bones in* Phascolomys Mitchelli, *Ow.*—There would be no doubt in determining *Phascolomys latifrons* by the naso-maxillo-premaxillary part of the skull, at least as being distinct from the other two known recent species, if even the still more characteristic part of the frontal bones was wanting. There might be more difficulty in pronouncing as to whether a fore part of the skull belonged to *Phascolomys platyrhinus* or to *Phasc. vombatus*.

I now proceed to compare such a fragment of a fossil skull of a Wombat on the basis of the characters which comparisons of different individuals of the three well-determined recent species of *Phascolomys* affords.

The fragment in question (Plate XVII. figs. 1, 3, 4, 5) includes the nasals (15) with parts of the frontals (11), lacrymals (73), malars (26), maxillaries (21), premaxillaries (22), and palatines (20). The nasals (15) are of the type of those in *Phascolomys vombatus* and *Phascolomys platyrhinus*; in the proportion of basal breadth to length and the speedy narrowing as they advance they resemble the modification shown in Woodcut, fig. 1, p. 174, in *Phasc. vombatus*. But small as is the extent of the naso-maxillary suture (15–21) in *Phasc. vombatus* (figs. 1 & 2) and *Phasc. platyrhinus* (fig. 3), it is still less in the fossil, the apex only of the basal expanse of each nasal (15) touching the maxillary (21) (Plate XVII. fig. 1) on each side of the skull. The naso-premaxillary suture (ib. 15–22, 22) runs along the side borders to within half an inch of the extremities (15′), which are obtusely pointed, as in *Phascolomys platyrhinus*. The suture or lateral border of the nasals describes but two curves, concave at the basal half, convex at the apical one; slight in both, in *Phascolomys Mitchelli*. The angle formed by the fronto-nasal suture (11–15) is as in *Phasc. platyrhinus* (fig. 3); and an obtuse process, 3 lines broad, of the frontal is wedged into the beginning of the internasal suture.

Seeing the variations in regard to such frontal wedge, as in the sinuous course of the lateral borders of the nasal, these bones could not differentiate by their form the fossil from the existing continental Wombat (*Phasc. platyrhinus*). The superiority of size is but small in the fossil; but the difference of connexion, shown in the almost exclusion of the maxillary from junction with the nasal, is a satisfactory distinctive characteristic of this part of the skull of the fossil Wombat under consideration, which I refer to the *Phascolomys Mitchelli*, Ow.*

* First defined in Appendix to Mitchell's 'Three Expeditions into the Interior of Eastern Australia,' vol. ii. 8vo, 1838, pl. 48. figs. 4–7, p. 368 (2nd ed.).

The present representative of that species is from the same bone-cave as the type fossils*; it has been flattened or crushed from above vertically downwards. The facial parts of the premaxillaries ($_{22}$, $_{22'}$) are on the same horizontal plane as the nasals ($_{15}$), which they suturally join. The frontals ($_{11}$, $_{11}$) have been pressed away from the nasals along the major part of the suture, and all the bones are more or less fractured. To this condition the skull had been reduced before the drip of the cavern had hardened the red mud about it. The process of clearing away such matrix was long and tedious.

Did the skull show the violence of a carnivorous troglodyte destroyer, or the effect of some cosmical force operating on the breccia-bed of the cave? If the former, the blunted laniaries of our old *Thylacoleo* are the only animal dynamic in Australia capable of so smashing the Wombat's head that I am as yet cognizant of.

§ 6. *Nasal bones in* Phascolomys Krefftii, Ow.—This species is founded on a fore part of a skull (Plate XVII. figs. 2, 6) discovered by Gerard Krefft, Esq., in the same bone-cave as the last-described fossil. It is as closely allied to the broad-fronted or hairy-nosed Wombat as *Phascolomys Mitchelli* is to the bare-nosed continental species; and the value of the nasal characters comes well out in the comparisons determining the present fossil.

It includes the major part of the nasals ($_{15}$), with the connected parts of the premaxillaries ($_{22}$) and maxillaries ($_{21}$). The nasals are broad and flat; their lateral margins are suturally joined with a smaller proportion of the premaxillaries than in *Phascolomys latifrons* (Woodcut, fig. 4, $_{22}$).

The free anterior extremities of the nasals ($_{15'}$) show nearly the same form and proportions as in that Woodcut; their basal breadth, where the naso-premaxillary suture ends anteriorly, is 1 inch 3 lines; the length of the outer margin is 1 inch in a straight line, but is rather more following the curve. The lateral suture, as it extends along the maxillary ($_{21}$), shows a slight uniform curve, concave outward. A portion of the left fronto-nasal suture ($_{11-15}$) indicates an oblique course from within outward and forward in about the same degree as in *Phascolomys platyrhinus*, fig. 3. I have not seen such course, as a variety, of that suture in any specimen or figure of the skull of the recent *Phascolomys latifrons*. Other instances of combination in the smaller fossil Wombats, such as are now under review, of characters which respectively specialize the Platyrhine and Latifront Wombats will be adduced in the present memoir.

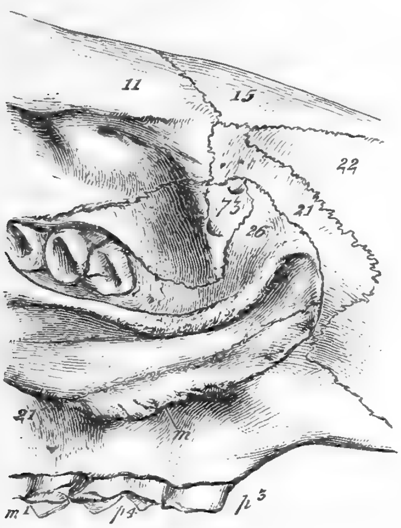
The length of the left nasal, as far as it is indicated by the preserved extent of its suture with the frontal, is 2 inches 10 lines; the extreme basal breadth cannot be given, on account of the side-fractures.

The internasal suture seems to be partially obliterated; and there is a narrow elliptical vacuity with rounded margins, situated ten lines from the tips of the nasals, six lines in length and two lines in extreme breadth, which seems to be natural, though probably an individual variety. I shall return again to this fossil in relation to other characters.

* Mitchell's 'Three Expeditions into the Interior of Eastern Australia,' vol. ii. 8vo, 1838, pl. 48. figs. 4–7.

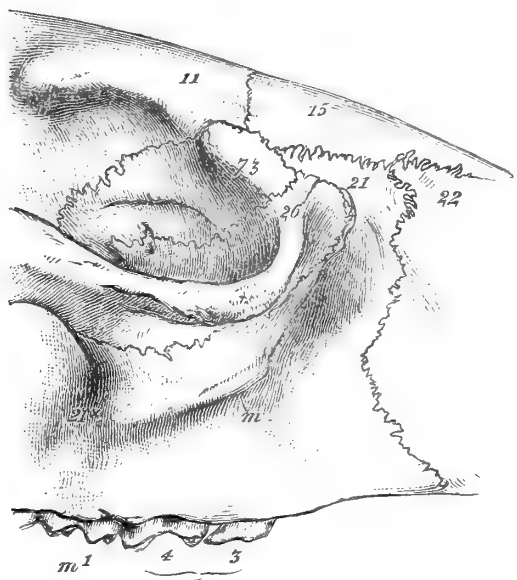
§ 7. *Lacrymal, maxillary, and palatal characters of* Phascolomys Mitchelli, *Ow.*—So much of the lacrymal ($_{73}$) is fortunately preserved on the right side of the subject of Plate XVII. fig. 3, *t*, as to indicate the affinity of the fossil to certain existing Wombats. This bone, both in *Phascolomys vombatus** and *Phasc. platyrhinus* (Woodcut, fig. 5), developes a prominent tubercle above $_{73}$ at its upper border, below the fronto-maxillary suture ($_{11-21}$). In *Phascolomys latifrons* (fig. 6) a feeble swelling of the lacrymal ($_{73}$), where it

Fig. 5.



Lacrymal &c. characters, *Phascolomys platyrhinus.*

Fig. 6.



Lacrymal &c. characters, *Phascolomys latifrons.*

joins the frontal ($_{11}$), answers to the tubercle. The indications of a lacrymal canal are minute in all Wombats. The lacrymal of *Phasc. Mitchelli* (Plate XVII. fig. 3, $_{73}$) shows the well-developed tubercle (*t*) in the same relative position to the fronto-maxillary suture as in *Phascolomys vombatus* and *Phasc. platyrhinus*: the bone anterior to the tubercle is flatter, less excavated in *Phasc. Mitchelli* than in those existing Wombats, and herein more resembles the lacrymal in *Phascolomys latifrons.*

The alveoli of the five upper molars of each side (Plate XVII. fig. 5, $p_{3, 4}$, $m_{1, 2, 3}$) with the intervening part of the bony palate (ib. $_{20, 21}$) are preserved in the present fossil. The form of the latter adheres to the type of that of *Phascolomys vombatus*† and *Phasc. platyrhinus* (Woodcut, fig. 7); in *Phasc. latifrons* (Woodcut, fig. 8) the palate ($_{20, 21}$) is less contracted anteriorly. The fore part of the postpalatal apertures (Plate XVII. fig. 5, *b*) does not reach that of the hindmost socket (m_3) in the fossil, which also in this respect agrees with *Phascolomys vombatus*‡ and *Phasc. platyrhinus* (Woodcut, fig. 7, *b*); whilst it

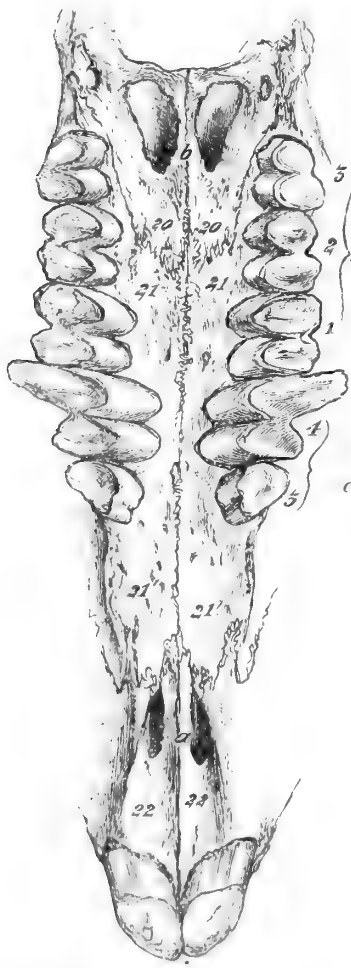
* Trans. Zool. Soc. vol. iii. pl. xxxvii. figs. 1 & 2. It is also represented in figs. 2 & 3 of Dr. Murie's memoir *loc. cit.* p. 814, but the suture dividing the tubercular lacrymal from the frontal is not marked.

† Trans. Zool. Soc. vol. ii. plate lxxi. fig. 1.

‡ Ibid.

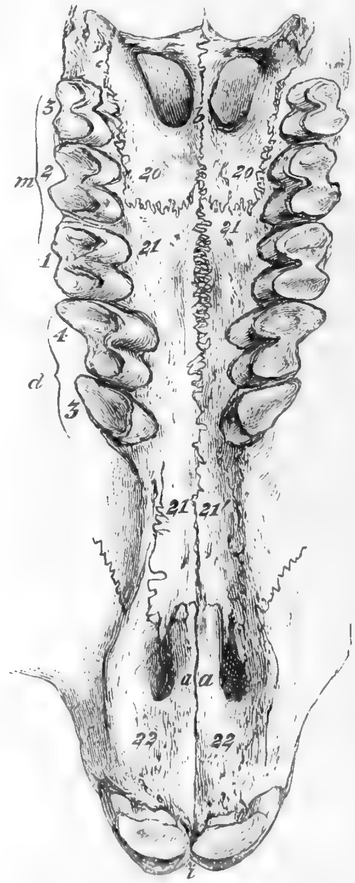
differs from *Phascolomys latifrons* (Woodcut, fig. 8, *b*), in which the postpalatal apertures extend forward beyond, or at least as far as, the interval between the last and penultimate sockets*. In the more advanced portion of the roof of the mouth I noticed (in 1845) a character† in *Phascolomys latifrons* by which it differed from *Phasc. vombatus*, and as I now know it also differs from *Phasc. platyrhinus*. The portion of bony palate

Fig. 7.



Palatal surface of upper jaw and teeth,
Phascolomys platyrhinus: nat. size.

Fig. 8.



Palatal surface of upper jaw and teeth,
Phascolomys latifrons: nat. size.

between the molary series and the incisors is more concave transversely, or deeper, in *Phascolomys latifrons* (Woodcut, fig. 8, 21, 21', 22, 22), and the channel is bounded by well-defined or sharp borders: this character is much better marked in the fossil (Plate XVII. fig. 5, 21, 21', 22, 22) than in the skulls of *Phascolomys vombatus* or *Phasc. platyrhinus*.

Another character in which the fossil resembles *Phascolomys latifrons* more than it

* In the latter variety (fig. 8) the apertures should extend more forward than is represented.

† Trans. Zool. Soc. vol. ii. plate lxxi. fig. 1. "The palatal surface of the intermaxillaries is deeper" (p. 304).

does the other two recent species is the greater vertical extent of the maxillary (Plate XVII. figs. 3 & 4, 21•) beneath the origin of the malar or zygomatic process (21•) of that bone (compare with Cuts 5 & 6, 21•). I shall recur to this character in the description of another fossil of the present genus.

§ 8. *Upper molars of* Phascolomys Mitchelli, *Ow.*—The differential characters of these teeth, as compared with their homologues in *Phascolomys vombatus*, have been elsewhere pointed out†. As to the two larger existing species, in the molar dentition of the upper jaw *Phascolomys Mitchelli* more resembles the platyrhine than the broad-fronted Wombat. In the latter the right and left upper molar series (Woodcut, fig. 8, d_3–m_3) run more parallel to each other, are less convergent anteriorly, with absolute greater breadth of the bony palate there. The first molar (d_3) in *Phascolomys latifrons* is, relatively to the second, larger in both upper and under jaws‡. I therefore limit the comparison of the upper molars in the present fossil to those of *Phascolomys platyrhinus* (fig. 7, d_3–m_3). The extent of the five alveoli, lengthwise, taken at their outlets, is the same in both; or at least the fossil (Plate XVII. fig. 5, d_3–m_3) exceeds only by about a line, giving 2 inches $2\frac{1}{2}$ lines instead of 2 inches 1 line as in *Phascolomys platyrhinus*. I have seen no example of *Phascolomys latifrons* in which the molar series extended beyond 2 inches; it is commonly less, as in Woodcut, fig. 8.

The alveolus of the first molar (d_3) of the fossil indicates a tooth not larger than in the Platyrhine Wombat. The other four molars, of which the first three are preserved on the left side and the last two on the right side, closely repeat the characters of these teeth in the Platyrhine Wombat§. This gives more weight to the differential characters of greater length and less breadth of the nasals, the greater concavity and sharper definition of the diastemal part of the bony palate, and the greater depth of the maxillary below the anterior pier of the zygomatic arch in *Phascolomys Mitchelli.*

§ 9. *Palatine foramina in* Phascolomys.—I next proceed to notice Phascolomydian fossils from the freshwater deposits of Queensland, in the interpretation of which some observations must be premised on the palatal foramina in existing species of Wombat.

In my first paper on the Osteology of the *Marsupialia* I state that *Phascolomys* resembles *Phascolarctos* and *Hypsiprymnus* in having "the posterior palatal openings large and situated entirely in the palatal bones; and that posterior and external to these are two small perforations" ||. In the other two species (*Phascolomys latifrons* and *Phascolomys platyrhinus*) determined by cranial characters since the date of that remark (1838), the generic characters of the postpalatal openings are repeated. These additional materials serve to test the statement that in Marsupials "the perforations of the bony palate

† MITCHELL's 'Three Expeditions into the Interior of Eastern Australia,' vol. ii. p. 368, pl. 48. See also WATERHOUSE, 'Natural History of the Mammalia,' 8vo, 1845, p. 244.

‡ *Loc. cit.* p. 304.

§ The second molar is abnormally worn, through slight displacement of the opposing tooth, as happens in other partially enamelled teeth of perpetual growth.

|| "On the Osteology of the Marsupialia," Trans. Zool. Soc. vol. ii. p. 389.

deserve particular attention; they are generally specific, and of consequence in the determination of recent and fossil species"†.

In the skull of the Wombat from Tasmania (*Phasc. vombatus*), figured in the same Paper‡ to illustrate the palatal and other characters afforded by a basal view of the cranium, the foramina are oval, the base which is behind being rounded; but the small anterior end of the oval is so nearly pointed as to suggest the term "triangular." In two skulls since compared these foramina present the same shape and proportions; in two smaller and younger skulls of *Phasc. vombatus* they are relatively smaller, and rather elliptical than oval. In two skulls of *Phascolomys platyrhinus* in the Collection of the British Museum I note that the postpalatal foramina are longitudinally elliptical or oblong in one, and are triangular in the other; the larger continental bare-nosed species showing the same variety as the smaller Tasmanian Wombat. This, therefore, is an exception to the general rule of the specific value of the postpalatal character§. The larger, especially the longer postpalatal varieties, encroach more forward and come nearer to the transverse parallel of the anterior wall of the hindmost socket. Allowance must be made for this variation.

In two skulls of *Phascolomys latifrons* the postpalatine foramina are relatively larger, especially longer, than in either the Tasmanian or Platyrhine Wombats, and they are rounded anteriorly, but less broad there than behind.

Dr. Murie‖ notes the larger size of the postpalatine foramina in *Phasc. latifrons* as compared with *Phasc. platyrhinus*, and I therefore attach the more value to the character, as probably being more constant in the latifront species. It must, however, be considered in connexion with the more constant cranial characters. The following fragmentary fossil from the "breccia-cave" of Wellington Valley exemplifies the need of keeping this relation in view. The fossil consists of a left maxillary and palatine, with the molar alveoli, fractured at both ends (Plate XVII. figs. 7, 8); the anterior fracture exposes the socket of the first molar, d_3. By the anterior contraction of the palate and by the size and proportions of the alveoli the fossil resembles *Phascolomys platyrhinus*; by the parallelism transverely of the fore part of the postpalatal aperture and the same part of the posterior alveolus, and by the height of the maxillary below the malar process of that bone (fig. 7, $_{21*}$), it resembles *Phascolomys latifrons*. By the combination of both characters it proves its relationship to *Phascolomys Mitchelli*; as in that species the prezygomatic ridge is less prominent or definite, and is higher placed than in existing Wombats.

§ 10. *Palate and upper molars,* Phascolomys Mitchelli, *from freshwater deposits,*

† "On the Osteology of the Marsupialia," Trans. Zool. Soc. vol. ii. p. 388.

‡ Ib. plate lxxi. fig. 6.

§ The skull of the Wombat, from New South Wales, with "two large triangular holes in the end of the palate," was probably the only one in the British Museum Collection at the date of Dr. Gray's comparison of it with the smaller Tasmanian species, which he believed to be differentiated by the "two moderate-sized oblong holes in the hinder part of the palate." ("Some Observations on the skull of *Phascolomys vombatus*," by J. E. Gray, F.R.S., Proc. Zool. Soc. 1847, p. 41.)

‖ *Loc. cit.* p. 844.

Queensland.—In a heavy petrified fragment of skull (Plate XVIII. figs. 1–4)†, including the molary series, upper jaw, and their alveoli, with the bony palate from its hind border or bar (*a*) to 4 lines in advance of the molars ($_{21}$, $_{21}$), the palate, as compared with that of the last-described fossil (Plate XVII. fig. 5), is more concave transversely, and its concavity is divided by a sharp ridge, extending from the interpalatine ($_{20}$, $_{20}$) along the intermaxillary‡ palatal suture, as far forward as the second molar (d_4).

The upper molars have a somewhat zigzag arrangement: the second (Plate XVIII. fig. 1, d_4) extends more mesiad than the first (d_3) or the third (m_1), the hind lobe of the third more so than the fore lobe of the fourth (m_2), and the hind lobe of the fourth more so than the fore lobe of the last molar (m_3). This arrangement is also shown in the palatal view of the fossil of *Phascolomys Mitchelli* (Plate XVII. fig. 5), and by the alveoli in the more fragmentary fossil of the same species (fig. 8) of the same Plate. The same character is seen in a minor degree in the outer contour of the grinding-surfaces. The antero-external angle of one tooth projects more outwardly than the postero-external angle of the tooth in advance. This arrangement, a tendency to which has been noted in *Diprotodon* and *Nototherium*, is more marked in the Tasmanian and Platyrhine Wombats, as in MITCHELL's fossil, than in *Phascolomys latifrons*.

The intermolary bony palate in the present fossil (Plate XVIII. fig. 1), though exceeding in length by the antero-posterior diameter of the last molar tooth that of *Phascolomys latifrons* (Woodcut, fig. 8), is narrower anteriorly than in that species, without being so broad posteriorly. It further differs from both this, the Platyrhine (Woodcut, fig. 7) and the Tasmanian existing Wombats, in the smaller size of the post-palatal foramina (ib. *b*, *b*); they are absolutely smaller than in *Phascolomys vombatus*, although the fossil indicates an animal as large as the largest *Phascolomys platyrhinus*. These foramina are, unfortunately, not preserved in the two previously described fossils; but the anterior boundaries in the subject of fig. 5, Plate XVII. indicate a size or breadth of the foramina equal to those in either the Latifront or Platyrhine existing species.

The antero-posterior extent of the molary alveoli, upper jaw, of the present fossil is 2 inches $2\frac{1}{2}$ lines, which is exactly that in the cave-fossil (Plate XVII. fig. 5) and in the largest Platyrhine Wombat. But the palate is narrower in the fossil by 1 line posteriorly, besides being deeper or more concave across, and divided by a mid ridge.

The differential character noticed in the preceding fossils is here repeated, viz. the greater depth of the outer alveolar plate of the maxillary (Plate XVIII. fig. 2, $_{21}$) below the zygomatic process (ib. $_{21*}$); it is $10\frac{1}{2}$ lines in the present fossil, and the premasseteric ridge or tuberosity (ib. *m*), less defined or prominent than in existing Wombats, is correspondingly raised above the alveolar outlets.

The worn surfaces of the molar teeth are rather broader transversely than in *Phasco*

† This fossil was presented to the British Museum, in 1861, by GEORGE BENNETT, Esq., F.L.S. It is from a freshwater deposit, Darling Downs.

‡ I use the term to signify the suture between the maxillary bones, in a sense different from that in which it is sometimes applied, viz. to the "premaxillary bone."

lomys platyrhinus, and the inner ends of the two lobes are more sharply, or less obtusely, angular than is usual in that species. The difference both in this character and the breadth of the molars is also notable between the present and the first-described fossil; but seeing the influence direction and degree of attrition have upon the size and shape of the grinding-surface of the molars, the differences noted may be within the limits of that influence. In the subject of Woodcut, fig. 7, d_4 had been abnormally abraded.

The characteristic downbending of the hind part of the palatines, which forms a transverse bar (Plate XVIII. fig. 1, *a*) behind the postpalatal apertures (ib. *b*, *b*), perforated at each end from behind forwards by a smaller aperture in the recent Wombats, is repeated in this present instructive fossil (ib. fig. 4, *d*, *d*).

This evidence of *Phascolomys Mitchelli* (Plate XVIII. figs. 1–4), from freshwater deposits, resembles *Phasc. platyrhinus* in the depth and position of the antero-internal longitudinal groove of d_3, which tooth is wanting in the cave fossil, although the socket (ib. fig. 5, d_3) indicates the same position of the groove. In *Phascolomys latifrons* the fore part of d_3 (Woodcut, fig. 8) is less produced than in *Phasc. platyrhinus* and *Phasc. Mitchelli*.

A difference in the grinding-surface of the upper molars and in the intervening bony palate between the subjects of fig. 5, Plate XVII., and fig. 1, Plate XVIII. is appreciable; but, as above remarked, the one may be due to a phase of attrition; and, moreover, the outer side of the surface is slightly mutilated in fig. 5, Plate XVIII.; whilst the variety in regard to a rising along the mid palatal suture in the Platyrhine Wombats warns against founding a specific distinction thereon.

These characters are of the less consequence, since, where they are not preserved in a fossil, there may be others which allow of no such hesitation in regard to the specific distinction of the Wombats; as, *e. g.*, in the case of that to which the fragment of skull about to be described belongs (Plate XVIII. figs. 5, 6, 7). It is a portion of the left maxillary with the bony palate intervening between the left and right molary series, the left series being in place (ib. fig. 7), the right represented by the second molar and the alveoli of the two following teeth: the extent of the left molary series at their issue from the alveoli is 2 inches 2 lines.

The chief value of the present specimen is the character of the malar process of the maxillary (ib. fig. 5, $_{21}$), which is preserved with the beginning of the attached part of the malar (ib. ib. $_{26}$) on the left side, showing the malo-maxillary suture. To this help in the determination of fossils of the marsupial genus under consideration I was led by the following comparisons.

In the largest of three skulls of *Phascolomys vombatus* available for the purpose, the left upper molary series, taken as in the fossil, does not equal 2 inches; it falls short by nearly a line. In the specimen figured in my "Osteology of the Marsupialia"*, it is 1 inch 8 lines; in the next in size it is 1 inch 10 lines; in an evidently younger Wombat, with all the molars in place and use, the series is 1 inch 7 lines.

* Trans. Zool. Soc. vol. ii. (1838) plate lxxi. fig. 6.

These five ever-growing teeth gain in fore-and-aft as in transverse diameter, until the full size of the individual is attained; they grow with the growth of the skull, though in a minor ratio; and I have no evidence of their exceeding in size the teeth requiring the extent of alveoli noted in the largest of the cranial specimens of *Phasc. vombatus* before me.

Now in this, as in the second-sized skull, the lower border of the malar process of the maxillary bone is 6 lines above the margin of the outer wall of the alveolar opening of m_2; in the younger and smaller skull it is 5 lines. In all the specimens the maxillary contributes to the inner and lower part of the beginning, or anterior pier, of the zygoma, speedily narrowing to a point as it passes backward on the outer side of the arch, where it ends about 7 lines from the back part of the origin of the process; the depth or vertical diameter of the outer side of the base of the zygomatic process of the maxillary is about 2 lines.

In the skull of a *Phascolomys latifrons* with an upper molary series, taken at the alveolar outlets, of 1 inch 10 lines in extent, the malar process of the maxillary rises $7\frac{1}{2}$ lines above the issue of the second molar, there contributes $3\frac{1}{2}$ lines in depth to the under and fore part of the beginning of the zygoma, and narrows to a point 7 lines behind its origin. In another skull of *Phascolomys latifrons* with a molary series of 1 inch 1 line in extent, the maxillary process rises 8 lines above the outlet of the second molar, and contributes a similar small proportion to the under and fore part of the zygoma.

In the skull of a *Phascolomys platyrhinus* with a molary series 2 inches 1 line in extent, the malar process of the maxillary (Woodcut, fig. 5, 21•) rises 6 lines above the outlet of the second molar, and contributes $3\frac{1}{2}$ lines to the vertical extent of the beginning of the zygoma (26), which here has a total depth of 1 inch 4 lines; the process (21•) decreases to a point at 9 lines from its origin.

In the fossil (Plate XVIII. fig. 5) with a molary series of the same extent as in the last skull, the malar process of the maxillary (21) rises 9 lines above the outlet of the molar, and contributes 7 lines to the vertical extent of the fore part of the zygoma (26). The different relation of the malo-maxillary suture to the premasseteric ridge (*m*) is strongly marked between the fossil and any of the recent species of Wombat, the interspace between the front pier of the zygomatic arch and the alveolar outlets being much greater in the fossil.

In the extent, especially hinder breadth and feeble concavity, of the bony palate, *Phascolomys platyrhinus* most resembles the present (ib. fig. 7) as it does the preceding fossil; but the zygomatic character only stands out the more strongly in connexion with this resemblance and the general size.

In *Phascolomys vombatus* the form of the palate resembles that in *Phascolomys platyrhinus*. It is rather more concave in some individuals than in others in both species; and in the Platyrhine Wombat I have noticed a slight mesial ridge along the bony palate.

In *Phascolomys latifrons* the palate is not only more concave, but is wider anteriorly, less triangular; and at the hind part formed by the proper palatine bones, their median

suture rises as a longitudinal ridge dividing the bony palate there into two concavities or longitudinal channels, leading backward to the postpalatal apertures.

§ 11. *Mandibular characters of existing Wombats.*—In differentiating by cranial characters the species of Wombat called *Phascolomys latifrons*, I noted, in comparing it with *Phascolomys vombatus*, that "the curve of the lower border of the lower jaw is much deeper, the inner angle of the condyle is less produced, the coronoid process is higher and narrower, and the postsymphysial depression is almost obsolete in the Latifront Wombat"*. With the exception of the latter particular, which is variable in both species, subsequently acquired skulls have confirmed the constancy of the above characters. They likewise serve to differentiate the mandible of *Phasc. latifrons* from that of *Phascolomys platyrhinus*, except that the coronoid process rises higher in the platyrhine species (Plate XXII. fig. 2, *c*) than in the Tasmanian Wombat (ib. fig. 1, *c*); but the broader proportion of the process as compared with that in the Hairy-nosed Wombat (ib. fig. 3, *c*) is retained. The deeper curve described by the lower contour of the jaw from the neck of the condyle to the incisive alveoli, as shown in fig. 5, Plate xxxvii. of the undercited volume†, is a constant and well-marked character of *Phascolomys latifrons*; so, likewise, is the less produced inner angle of the condyle, shown in fig. 7, *c d*, of the same Plate. In both the Tasmanian and Platyrhine Wombats this angle is more produced and deflected.

The diastemal part (Plates XIX., XX. & XXI. l, s') of the long symphysis (ib. s, s') is subject to some variety in existing Wombats. In two mandibles of *Phascolomys platyrhinus*, in which the length of the series of molar alveoli is 2 inches 3 lines, that of the interval between the first alveolus and the foremost angle of the symphysis is, in one skull, 1 inch $7\frac{1}{2}$ lines (Plate XXI. fig. 2), in the other 1 inch $6\frac{1}{2}$ lines; the breadth of the diastema, midway, is the same in both, viz. 10 lines.

In a mandible of *Phascolomys latifrons* with the molar series of alveoli 2 inches in extent (Plate XX. fig. 1), the diastema (l, s'), taken as above to the foremost point at the interspace of the incisors, is 1 inch 6 lines; in a second mandible with the molar alveoli 1 inch $10\frac{1}{2}$ lines in extent, that of the diastema is also 1 inch 6 lines: the breadth of the diastema, midway, is in the first mandible 8 lines, in the second 7 lines.

In the two mandibles of the Platyrhine Wombat compared, the diastema is slightly convex both lengthwise and across; it is traversed by a pair of shallow longitudinal grooves, and is not sharply defined from the sides of the symphysis. In a third mandible of the same species (Plate XIX. fig. 2, l, l) the defining ridges are better marked, the transverse convexity is less so; and this part of the symphysis is rather longer and narrower than in the other two mandibles. In these respects the third mandible approaches nearer to *Phascolomys latifrons*; but it differs, as do the other mandibles of the same species as well as those of *Phasc. vombatus*, in the larger, especially broader, incisive alveoli, and in the oblique course of their upper margins from the mid line of the sym-

* "On the Osteology of the Marsupialia" (Part II.) (1845), in Transactions of the Zoological Society, vol. iii. p. 304, plate xxxvii. figs. 2 & 5.

† Trans. Zool. Soc. vol. iii.

physis outward and backward. The fore end of the symphysis of *Phasc. latifrons* is at once recognizable by the narrower outlets of the incisive alveoli, and the more transverse course of their upper border (Plate XX. fig. 1, s'). The lateral borders of the outlets are also more nearly vertical, and do not slope backward as they descend, like those of the incisive alveolar outlets in *Phascolomys platyrhinus* and *Phasc. vombatus**.

With the narrower alveoli associated with the more compressed form of the incisors of *Phasc. latifrons*, one may predicate of a generally narrower diastemal part of the symphysis, the upper surface of which, with a mesial canal towards the end and the two parallel longitudinal grooves obsolete or nearly so, is better defined from the sides of this part of the symphysis. In one jaw of *Phasc. latifrons* the defining ridges are sharp, and the intervening upper surface is concave transversely to near the incisive outlets, where the defining ridges subside. I may note that the anterior outlet (v) of the dental canal in three mandibles of *Phascolomys platyrhinus* is 1 inch 4 lines, or 1 inch 5 lines behind the foremost point of the symphysis (Plate XXII. fig. 2, v): in one mandible of *Phasc. latifrons* (ib. fig. 3) it is 1 inch behind the fore end of the symphysis, in another mandible it is 10 lines from the same part. The foramen is more anteriorly situated in the broad-fronted or hairy-nosed species: it opens nearer to the molar series in *Phasc. vombatus* (ib. fig. 1, v)†. I may further note that in the mandibles of two individuals examined since describing that of the type skull of *Phascolomys latifrons*, the intercommunicating foramen from the entry of the dental canal to the outer surface of the base of the coronoid is smaller in one, as in the type mandible, than in the Platyrhine and Tasmanian Wombats, while in the other it does not exist. It is interesting to find this variety, because, in the great *Diprotodon* and *Notothere*, with some affinities to *Phascolomys*, the absence of the perforation of the base of the coronoid process is the rule, as in the Marsupialia generally.

The first lower molar (d_3) in *Phasc. latifrons* (Plate XX. fig. 1) has a subquadrate transverse section; in *Phasc. platyrhinus* (Plate XIX. fig. 2) and *Phasc. vombatus* (ib. fig. 1, d_3) it has an elliptic or ellipsoid transverse section. The outer depression (Plate XXII., f) of the ramus ascendens, or "ectocrotaphyte cavity," is less deep in *Phasc. latifrons* (ib. fig. 3), and shallows more gradually forward, than in the bare-nosed recent species (ib. figs. 1 & 2); the inflected angle (a), viewed from below as in Plate XXIII., has a broader base in proportion to its length, and is not produced so far or directly backward in *Phascolomys latifrons* (fig. 3) as in *Phasc. platyrhinus* (fig. 1).

§ 12. *Mandibular characters of extinct Wombats similar in size to the recent species.*—I now proceed to apply the above characters and comparisons of the mandibles of the known existing kinds of Wombat in the attempt to elucidate the fossil mandibular

* This latter character differentiating *Phascolomys vombatus* from *Phasc. latifrons* is shown in figs. 3 *c* & 7 *c* of plate xxxvii. *tom. cit.*

† This character is shown in the figures of the mandible of the Tasmanian and Broad-fronted Wombats in plate xxxvii. of my second memoir (*tom. cit.*); but I could not then, as now, depend upon the constancy of such character.

evidences of similar-sized Wombats, of which I have received or worked out twelve specimens from the breccia-masses transmitted to the British Museum by the Trustees of the Australian Museum, Sydney, New South Wales, in conformity with the desire of the Colonial Legislature, and in connexion with their liberal vote in aid of further explorations of the bone-caves discovered by Sir THOMAS MITCHELL, C.B., Wellington Valley. Four other and more complete specimens are from the freshwater deposits of Queensland. The first of the cave specimens which I shall describe consists of the almost entire symphysis (Plate XX. fig. 2 & Plate XXIII. fig. 4), and it is the only specimen from the breccia which shows this instructive part of the lower jaw. With the bone are included the implanted bases of the incisors (i), the three anterior molars of the right side (d_3, d_4, m_1), and parts of the first and second molars of the left side. The upper surface of the diastemal part of the symphysis (l, s) is concave transversely, divided by sharp margins from the sides, and has a mesial longitudinal channel at the anterior third, without the pair of such channels. Lengthwise the upper contour of the diastema is slightly concave (Plate XXII. fig. 7, l, s'). From the fore part of the anterior molary alveolus to the broken end of the symphysis is 1 inch 6 lines; the breadth of the symphysis midway is 9 lines. So far the fossil shows a closer affinity to *Phascolomys latifrons* (Plate XX. fig. 1) than to the other two existing species, and more especially to the variety, fig. 3, Plate XXII.

This affinity is more decisively shown by the form of the incisors in transverse section (Plate XX. fig. 2, i, i) and of the anterior molars (ib. d_3). The enamel covers and defines the lower broad flattened side of the incisor, bending up a little way upon both outer and inner sides, which converge toward the upper, narrower surface, but unequally; the outer surface descending therefrom, at first more vertically, toward the base, while the inner surface slopes to the mid line of the symphysis as it descends.

Thus there is a greater interval between the upper than the lower sides of the two incisors; the vertical exceeds the transverse diameter of the transverse section of the tooth. In these characters the lower incisors of the fossil agree with those of *Phascolomys latifrons.*

In the Platyrhine and Tasmanian Wombats the transverse prevails over the vertical diameter of the exposed end of the incisors, and the enamel bends up from the lower along the outer surface nearly to the upper one, describing a uniform convexity, transversely.

The fossil adheres also to the latifront type in the shape of the first molar, d_3 (fig. 2, Plate XX.), and resembles the Hairy-nosed Wombat in the size of its molars, which is less than in *Phascolomys platyrhinus* (Plate XIX. fig. 2, d_3, d_4, m_1). But the following differences present themselves in the comparison of the present fossil with the corresponding part of the mandible of *Phascolomys latifrons.* In that species the upper transversely concave intermolar part or surface of the symphysis does not extend backward beyond the alveolus of the second molar; at the third molar the inner wall of the jaw soon changes its concavity for a convexity bending down to the back part of the symphysis. In *Phascolomys platyrhinus* the concave upper surface of the symphysis extends further back, and this character is exaggerated in the fossil; for the inner wall

of the socket of the third molar (Plate XX. fig. 2, m_1) arches inward as it descends, continuing the diastemal transverse concavity to that part of the molar series where the hinder fracture of the present fossil has occurred, exposing the long curved implanted part of the third molar (m_1, fig. 3).

Another difference is seen at the under part of the symphysis of the fossil (Plate XXIII. fig. 4) as compared with that in the latifront species (ib. fig. 3). In this the longitudinal contour is convex, concurrently with the greater general convexity of the curve of the lower border of the mandible (Plate XXII. fig. 3); in the fossil (ib. fig. 7) the lower surface of the symphysis runs straight, or very nearly so, from the hind fracture to the outlets of the incisive alveoli (s'), along a preserved symphysial extent of 2 inches 8 lines. It is interesting to see that here, again, the fossil resembles the Platyrhine species (Plate XXII. fig. 2), the older spelæan form combining to a certain extent characters kept apart in still existing species of Wombat. Nevertheless the more essential resemblances are to the *Phascolomys latifrons*. The pair of subsymphysial foramina (Plate XXIII. fig. 4, *r*) characteristic of the Wombats are wider apart (4 lines) than in the Platyrhine (ib. fig. 1, *r*) and Tasmanian (ib. fig. 2, *r*) species, and show rather the latifront character; they have the usual relative position to the fore and hind ends of the symphysis.

The specific distinction between the broad-fronted (Plate XXII. fig. 3) and other existing Wombats (ib. figs. 1 & 2) afforded by the ascending ramus of the mandible induced attention to all the cave fragments of that part of the lower jaw, and led to careful removal of the matrix from both the outer and inner depressions. This brought to light the modification of the lower part of the ectocrotaphyte depression (*f*) shown by the subject of fig. 6, Plate XXII. In the minor depth of the base or lower part of that depression the fossil mandibular fragment agrees with *Phascolomys latifrons* (ib. fig. 3, *f*), and more especially with the variety above noted with the absence of the transverse perforation (Plate XXII. fig. 3). The part of the base, or below the base, of the coronoid in the fossil where the canal opens externally in the normal mandibles of *Phasc. latifrons* * is entire; it is also less depressed there than in the perforate variety. From this and the normal mandible of the latifront species the fossil (Plate XXII. fig. 6) differs in the relative position of the anterior beginning of the "ectocrotaphyte ridge" (*h*) or that bounding below the ectocrotaphyte depression (*f*). In the three recent species (ib. figs. 1, 2, 3) this ridge (*h*) begins near the lower border of the ramus; in the fossil (ib. fig. 6, *h*) it begins midway between the lower and upper borders, and on a vertical parallel with the third or antepenultimate molar (m_1)—consequently more in advance than in the recent Wombats, in which both the ridge and the base of the coronoid (*q*) begin below the fore part of the penultimate molar (m_2). Both penultimate and last molars are in place and are worn in the fossil, so the differences above noted cannot relate to nonage. The beginning of the ectocrotaphyte ridge is $10\frac{1}{2}$ lines below the outlet of the first division of the alveolus of m_2 in *Phasc. latifrons* (ib. fig. 3, *h*), and is 1 inch below the same part in *Phasc. platyrhinus* (ib. fig. 2, *h*); in the fossil it is 6 lines below the hind

* Trans. Zool. Soc. vol. iii. plate xxxvii. fig. 5.

division of the alveolus of m_1. The anterior origin of the coronoid appears to be proportionally advanced in the fossil. The outer surface of the ramus below the beginning of the ectocrotaphyte ridge slopes more gradually inward and lower down before passing into the broad under surface of the jaw in the fossil (Plate XXII. fig. 6). In the recent Wombats the same surface curves, with a stronger and shorter convexity, into the lower border, yet less abruptly in *Phasc. latifrons* (ib. fig. 3, *k*) than in *Phasc. platyrhinus* (ib. fig. 2, *k*).

The ectalveolar groove is longer, deeper, and narrower in the fossil (Plate XIX. fig. 3, *u*), owing to the more advanced origin of the coronoid (*q*) and its greater proximity to the last two alveoli (m_2, m_3); this differential character is still more marked as compared with the Platyrhine species (ib. fig. 2, *u*). From so much of the entocrotaphyte ridge, or anterior beginning of the inflected angle, as is preserved, the degree of inflection appears to have been less in this fossil (Plate XXIII. fig. 5, *a*) than in the recent species (ib. figs. 1, 2, 3, *a*). The surface broadening as it recedes, between the ecto- and entocrotaphyte ridges, is not only flattened but becomes rather concave in the fossil toward the inner border.

The two hindmost molars in place (Plate XIX. fig. 3, m_2, m_3) are narrower than those in *Phasc. latifrons* (Plate XX. fig. 1, m_2, m_3), as are the anterior molars in the fossil previously described (ib. fig. 2, d_3, d_4). To the species represented by the last-cited fossil, I am disposed, from the resemblance of the symphysis to that in the imperforate variety of *Phasc. latifrons*, to refer the present fossil. They might be parts of the same mandible, as well as of the same species; but more complete specimens must confirm or confute this supposition. It is certain that both fossils show the nearest resemblance to the mandibular imperforate variety of *Phascolomys latifrons* above named, yet with marked differences, in value equalling those interpreted and accepted as specific. The part of the dental canal which courses along the inner side of the molar alveoli and the bottoms of the last two alveoli are exposed by fracture of the thin film of bone originally covering them.

In reference to the characters of the two portions of fossil mandible above defined, as they plainly justify the inference that they belonged to a species of *Phascolomys* as distinct from the three accepted recent species as these differ from one another, each might be indicated by a specific name; and it may ultimately prove that they do belong to distinct species.

The same remark applies to both or either in relation to the maxillary fossil from the same cavern (Plate XVII. figs. 2 & 6) which I have referred to a *Phascolomys Krefftii*.

Considering, however, that the two portions of mandibles combine, like that maxillary one, characters of affinity to *Phascolomys latifrons* with differential ones forbidding a reference to that species, it may be, and may be probable even, that they all belong to the same extinct species. I prefer, therefore, to indicate them as parts of a *Phascolomys Krefftii*, and leave to those who may be so fortunate as to obtain evidence to the con-

trary, to impose their own specific denominations on the so demonstrated distinct kind of Wombat.

§ 13. *Mandibular fossils of* Phascolomys latifrons.—Of six other mandibular fragments showing the fore part of the ectocrotaphyte depression, two mutilated right rami (Plate XXII. figs. 4 & 5), by the gradual beginning and degree of deepening of that depression (f), agree with the perforate or normal mandible of *Phascolomys latifrons*. The outer orifice of the transverse canal or perforation (ib. p) holds the same position in these fossils: one of them (ib. fig. 4) includes the four anterior molars and the socket of the fifth; the other (fig. 5) includes the four posterior molars. The fore-and-aft extent of the series of five sockets, in each specimen, is 2 inches, the depth of the mandible at the back part of the symphysis is (in fig. 5) $6\frac{1}{2}$ lines; in fig. 4 it is 1 inch 5 lines. The ectalveolar groove (Plate XIX. fig. 4, u) is narrow. The inner wall of the ramus, forming that of the second (d_3) and third (d_4) sockets, descends more vertically than in the first described fragment (Plate XX. fig. 2), or in the Tasmanian (Plate XIX. fig. 1) and Platyrhine (ib. fig. 2) Wombats. The hind end of the symphysis is on the vertical parallel of the interval between d_4 and m_1, or not further back than the middle of m_2 (Plate XIX. fig. 4, s'). In both these characters the present fossils come nearer to the latifront species (Plate XX. fig. 1, s) than to the Platyrhine and Tasmanian Wombats. The first molar (d_3) repeats the formal characters of that tooth in the *Phasc. latifrons*.

I conclude, therefore, that the mandibular fossils under description belonged to a "hairy-nosed" Wombat, and one nearer to the existing species than the preceding fossil (Plate XX. fig. 2), in which the symphysis appears to have extended as far back as it does in *Phascolomys platyrhinus* (Plate XIX. fig. 2).

§ 14. *Mandibular fossils of* Phascolomys Mitchelli.—I now come to mandibular fossils which, in the depth of the base of the ectocrotaphyte depression (Plate XXI. fig. 5, f), resemble the Tasmanian and Platyrhine Wombats. Four of these have the entire molar series in place. In one (Plate XIX. fig. 5) the extent of the series is 2 inches 2 lines; the first molar, however (d_3), agrees in shape and size with that in *Phasc. latifrons* (Plate XX. fig. 1, d_3).

The transverse concavity of the inner wall, continued from the first and second molar sockets and upon the symphysis half an inch in advance, more resembles that in the imperforate variety of the Latifront Wombat than in any other mandible of recent species. The symphysis (Plate XXI. fig. 6, s) does not extend so far back as in the Tasmanian (ib. fig. 1, s) and Platyrhine (ib. fig. 2, s) Wombats. From the fore part of the first molar socket to the back part of the upper division (ib. fig. 6, s^*) of the symphysial surface, in the fossil, measures 1 inch; and this part of the symphysis is on the vertical parallel of the hind lobe of the second molar. The lower division (s) terminates, as in fig. 4, below the interval between d_4 & m_1.

The fore part of the root of the coronoid, in the fossil (ib. fig. 5, q), stands out from the alveolar wall of the penultimate molar, as in *Phasc. latifrons*; not from that of the last molar, as is the rule in the Tasmanian (Plate XXII. fig. 1, q) and Platyrhine (ib. fig.

2, *q*) Wombats. The extent of the molar series and the sizes of the individual teeth accord, save in the narrower character of the lower molars, with the teeth of the upper jaw in the subject of figure 5, Plate XVII. If these fossils are maxillary and mandibular specimens of the same species of Wombat, the lower molars are relatively narrower transversely, compared to the upper ones, than in any of the existing species.

In the mandibular specimen under consideration we see combinations of characters confined severally to distinct species in existing Wombats. I am disposed therefore, and for reasons above assigned, to refer this mandibular fossil, with the maxillary one above cited, to *Phascolomys Mitchelli.*

A second similar specimen of left ramus, including part of the symphysis and of the ascending ramus, has a molar series 2 inches in extent, and, as in fig. 5, Plate XIX., the teeth have the general characters of those in *Phascolomys latifrons*; they are transversely narrower than in *Phascolomys vombatus* or *Phasc. platyrhinus.* The ectocrotaphyte depression is deeper than in the perforate mandible of that species; the perforation (*p*) here shows a similar position and size. The depth of this fossil jaw at the back part of the symphysis is 1 inch 5 lines. The symphysis terminates below the interval, between the second (d_4) and third (m_1) molars. The ectalveolar groove is wider than in the subject of fig. 3, Plate XIX., but is deeper than in the Platyrhine and Tasmanian Wombats. The symphysis is not bilobed behind, as in fig. 6, Plate XXI.; but this and the before-mentioned differences from that subject probably exemplify the range and seat of variety in the mandibular characters of one and the same species.

The characters noted in the subjects of figs. 4 & 5, Plate XXIII., of fig. 4, Plate XXI., and of figs. 2 & 3, Plate XX., are of specific value; but, as in the maxillary fossils (Plate XVII. figs. 1 & 2), I do not feel grounds for indicating, after comparison of the mandibular fossils from the Wellington-Valley breccia-caves, more than two species of a size not exceeding the known existing Wombats, and not referable thereto.

§ 15. *Mandibular characters of* Phascolomys Thomsoni, *Ow.*—From the freshwater deposits of Queensland I have received mandibular fossils of the genus *Phascolomys*, which, with decrease of size, show characters not in accordance with those of any of the cave fossils.

The subject of figs. 8 & 9, Plate XVIII., and fig. 7, Plate XXI., is a right mandibular ramus, with slight mutilation at both ends. In the lower contour of the jaw, the depth of the ectocrotaphyte depression (*f*), the breadth of the ectalveolar groove (*u*), the position and size of the intercommunicating foramen (*p*), the shape of the anterior molar (d_3), and the shape and proportions of the incisor (*ï*), so far as these are indicated, the present fossil agrees with *Phascolomys platyrhinus*, and differs from *Phascolomys latifrons* and *Phasc. Mitchelli.* It agrees, however, with these, and differs from both the bare-nosed Wombats, in the relative position of the back part of the symphysis (Plate XXI. fig. 7, *s*), which does not extend beyond the vertical line dropped from the front lobe of m_1.

The grinding-surface of d_3 (Plate XVIII. fig. 9) is an ellipse with the long axis nearly parallel with that of the mandible. The outer side of the incisor is transversely convex,

and curves uninterruptedly to the underside, as in *Phasc. platyrhinus* and *Phasc. vombatus.* In size this fossil does not exceed the Tasmanian species. The antero-posterior extent of the working-surfaces of the five molars is the same, viz. 1 inch 11 lines; but the teeth are rather narrower transversely, and the last molar, especially its hinder lobe, shows a greater decrease, as in the Hairy-nosed Wombat.

I indicate this modification of *Phascolomys*, from which the present fossil has been derived, by the name of the late estimable Professor of Geology in the Sydney University, New South Wales, ALEX. M. THOMSON, D.Sc. The specimen is from a lacustrine deposit at Gowrie, Darling Downs, Queensland, and was presented to the British Museum by Sir WILLIAM McARTHUR, Bart.

§ 16. *Mandibular fossil of* Phascolomys platyrhinus, *Ow.*—The subject of figs. 3 & 4, Plate XX., well exemplifies the differences by which *Phascolomys platyrhinus* differs from *Phascolomys Thomsoni.* The symphysis has the same backward extent and relative position to the molar series as in the recent specimen (Plate XIX. fig. 2); the character of the upper surface of the diastemal tract (l) is repeated; the formal characters of d_3 and of i in the fossil are precisely those in the recent continental bare-nosed Wombat: in size the fossil equals the largest living specimen of that species. The antero-posterior extent of the molar series is 2 inches $2\frac{1}{2}$ lines. The shape and proportions of the molars characteristic of *Phascolomys platyrhinus* are closely preserved in the fossil. It was obtained from the bed of a tributary of the Condamine River, Queensland, by EDWARD S. HILL, Esq., and shows that the characters of the actual Platyrhine species were established at a period coeval with the existence of *Diprotodon* and *Thylacoleo.*

§ 17. *Mandibular and lower molary characters of* Phascolomys parvus, *Ow.*—With present evidence of the constancy of size of the molar series of teeth in existing and extinct species of Wombat, such series fully in place and well worn, having a longitudinal extent of 1 inch 5 lines, cannot be referred to a species with a longitudinal extent of molars never less than 1 inch 9 lines, and usually more: as, *e. g.*, in the Tasmanian Wombat, which is the smallest of the known existing species. The series of molars in Plate XIX. fig. 6, contrasted with those in fig. 1, is implanted in a mandible of similar small size (Plate XX. figs. 6 & 7). In the lower contour, the depth of the ectocrotaphyte fossa (f), the breadth of the ectalveolar groove, the shape and size of the incisor, and the shape of the grinding-surface of the anterior molar (d_3) this fossil agrees with *Phascolomys platyrhinus.* But the symphysis (Plate XX. fig. 7, s) does not extend so far back; it ends there below the interspace between the second (d_4) and third (m_1) molars. The hind contour of the symphysis is subbilobed (ib. s, s^*); it is long, but less deep relatively than in *Phascolomys Mitchelli* (Plate XXI. fig. 6).

The grinding-surface of the anterior molar (Plate XIX. fig. 6, d_3) is subelliptic, with the long axis nearly parallel with that of the jaw, 2 lines and 1 line in the two diameters, showing the usual disposition of the incomplete coat of enamel. The succeeding molars have the normal bilobed or biprismatic shape; their grinding-surfaces do not exceed severally $3\frac{1}{2}$ lines, the fore lobe of the first (d_4) and the hind lobe of the last (m_3) being

the smallest. The hinder half of the diastemal tract, above, is bounded by a ridge (*l*) on each side, and is there transversely concave. The outlet of the dental canal (Plate XX. fig. 6, *v*) is more advanced in position than in *Phascolomys vombatus* (Plate XXII. fig. 1, *v*). The outer enamelled surface of the incisor is transversely or vertically convex, curving uninterruptedly to the lower border of the tooth, as in the bare-nosed Wombats, but with less relative breadth of the tooth than in those existing species. Sufficient of the angle of the jaw is preserved to show the partial division of the large cavity formed by its inward extension into the inner (*d*) and outer (*e*) angular depressions (Plate XXIII. fig. 7). The base of the coronoid process (Plate XX. figs. 6 & 7, *c*) is 6 lines in fore-and-aft extent; in *Phascolomys vombatus* it is 11 lines.

The well-marked characters of this small extinct species are satisfactorily repeated in a second mandibular specimen, also of the left ramus, but more mutilated behind. It retains, however, the anterior end entire; and the incisor shows its worn surface (Plate XIX. figs. 6 & 7, *i*). The vertical diameter of the incisor equals the long diameter of the working-surface of the second molar tooth, d_4.

A third illustration of this diminutive species is likewise afforded by a portion of the left mandibular ramus; it is a small portion, but includes the last two molars and the hind half of the antepenultimate molar. The base of the common plate of the coronoid and condyloid processes is in part preserved, with a broken beginning of the ectocrotaphyte ridge: these, with the postalveolar ridge and ectalveolar groove, repeat the characters of the more complete ramus (Plate XX. figs. 6 & 7). The size of both bone and teeth is the same in all. The present fossil, by the well-worn crowns of the molars, appears to be from an old individual. The formal characters are incompatible with a reference of those of size to immaturity.

All the specimens of *Phascolomys parvus* were in the Boydian Collection of fossils from the Lacustrine deposits of King's Creek, Darling Downs, Queensland, purchased by the British Museum, and are in the same mineralized condition as the remains of *Diprotodon* in the same collection.

I reserve for another communication the evidences of extinct Wombats exceeding in size the existing species.

Explanation of the Plates.

PLATE XVII.

Fig. 1. Upper view of anterior portion of skull of *Phascolomys Mitchelli*.
Fig. 2. Upper view of anterior portion of skull of *Phascolomys Krefftii*.
Fig. 3. Right side view of anterior portion of skull of *Phascolomys Mitchelli*.
Fig. 4. Left side view of the same skull.
Fig. 5. Under view of the same skull.
Fig. 6. Front view of the portion of skull of *Phascolomys Krefftii*.
Fig. 7. Portion of left maxillary, *Phascolomys Mitchelli*.
Fig. 8. Palatal surface and upper molars of *Phascolomys Mitchelli*.

PLATE XVIII.

Fig. 1. Palatal surface and upper molars, *Phascolomys Mitchelli.*
Fig. 2. Side view of the same portion of skull.
Fig. 3. Front view of the same portion of skull.
Fig. 4. Back view of the same portion of skull.
Fig. 5. Side view of the left maxillary, *Phascolomys Mitchelli.*
Fig. 6. Front view of the same portion of skull.
Fig. 7. Palatal surface and molar teeth of ditto.
Fig. 8. Outside view of right mandibular ramus of *Phascolomys Thomsoni.*
Fig. 9. Upper view with grinding-surface of lower molars of the same fossil.

PLATE XIX.

Fig. 1. Upper view of mandible and mandibular teeth, *Phascolomys vombatus.*
Fig. 2. Upper view of mandible and mandibular teeth, *Phascolomys platyrhinus.*
Fig. 3. Upper view of a portion of the left mandibular ramus with the last two molars, *Phascolomys Krefftii.*
Fig. 4. Upper view of a portion of the right mandibular ramus, *Phascolomys latifrons.*
Fig. 5. Upper view of a portion of the left mandibular ramus, *Phascolomys Mitchelli.*
Fig. 6. Upper view of a portion of the left mandibular ramus, *Phascolomys parvus.*
Fig. 7. Outer side view of the same fossil.

PLATE XX.

Fig. 1. Upper view of mandible and mandibular teeth, *Phascolomys latifrons.*
Fig. 2. Upper view of the fore part of the mandible, *Phascolomys Krefftii*: 2 *a*, transverse section of the incisors.
Fig. 3. Upper view of a portion of the mandible of *Phascolomys platyrhinus.*
Fig. 4. Under view of the same fossil: 4 *a*, transverse section of the incisors.
Fig. 5. Side view of fore part of the same jaw.
Fig. 6. Outer side view of the left mandibular ramus, *Phascolomys parvus.*
Fig. 7. Inner side view of the same fossil.
Fig. 8. Under surface of angular part of the same fossil.

PLATE XXI.

Fig. 1. Inner side view of the right mandibular ramus, *Phascolomys vombatus.*
Fig. 2. Inner side view of the right mandibular ramus, *Phascolomys platyrhinus.*
Fig. 3. Inner side view of the right mandibular ramus, *Phascolomys latifrons.*
Fig. 4. Inner side view of a portion of the right mandibular ramus, *Phascolomys latifrons.*

Fig. 5. Outer side view of a portion of a left mandibular ramus, *Phascolomys Mitchelli*.
Fig. 6. Inner side view of the same fossil: drawn without reversing.
Fig. 7. Inner side view of a portion of the right ramus, *Phascolomys Thomsoni*.

PLATE XXII.

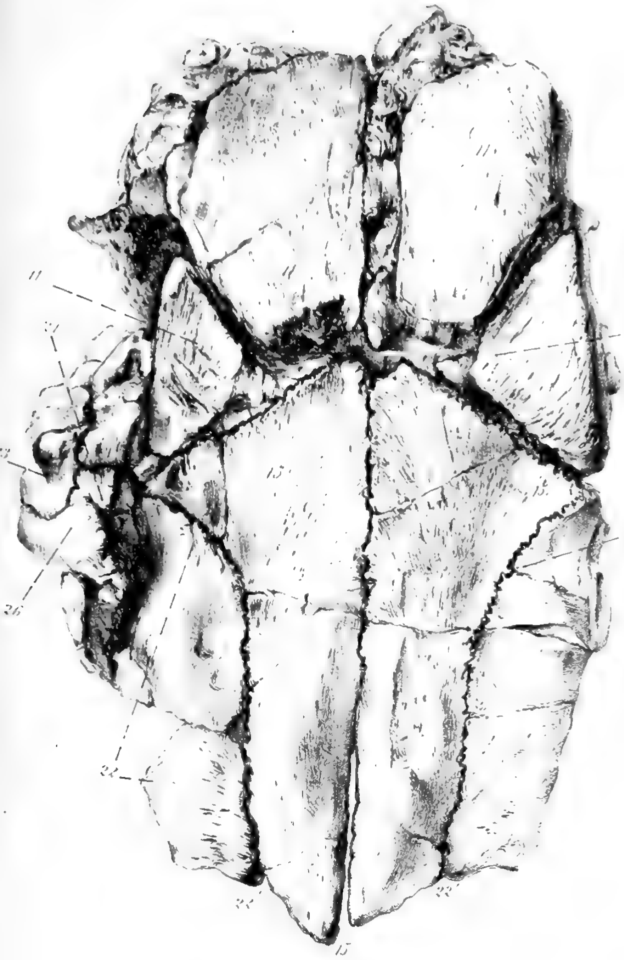
Fig. 1. Outer side view of the right mandibular ramus, *Phascolomys vombatus*.
Fig. 2. Outer side view of the right mandibular ramus, *Phascolomys platyrhinus*.
Fig. 3. Outer side view of the right mandibular ramus, *Phascolomys latifrons*.
Fig. 4. Outer side view of part of the right mandibular ramus, *Phascolomys latifrons*.
Fig. 5. Outer side view of part of the right mandibular ramus, *Phascolomys latifrons*.
Fig. 6. Outer side view of the hind part of the right mandibular ramus, *Phascolomys Krefftii*.
Fig. 7. Outer side view of the fore part of the right mandibular ramus, *Phascolomys Krefftii*.

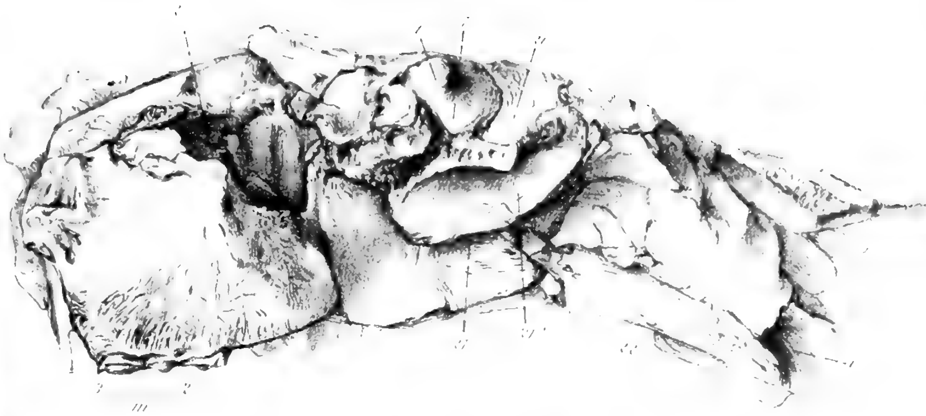
PLATE XXIII.

Fig. 1. Under view of mandible, *Phascolomys platyrhinus*.
Fig. 2. Under view of the left ramus and symphysis of mandible, *Phascolomys vombatus*.
Fig. 3. Under view of the right ramus and symphysis of mandible, *Phascolomys latifrons*.
Fig. 4. Under view of the symphysis of mandible, *Phascolomys Krefftii*.
Fig. 5. Under view of the hind part of the left ramus of mandible, *Phascolomys Krefftii*.
Fig. 6. Back view of the hind part of the left ramus of mandible, *Phascolomys parvus*.
Fig. 7. Upper view of the same part of the fossil.
Fig. 8. Transverse section of lower incisors, *Phascolomys platyrhinus*.
Fig. 9. Transverse section of lower incisors, *Phascolomys latifrons*.

LIST OF WOODCUTS.

All the figures are of the natural size.





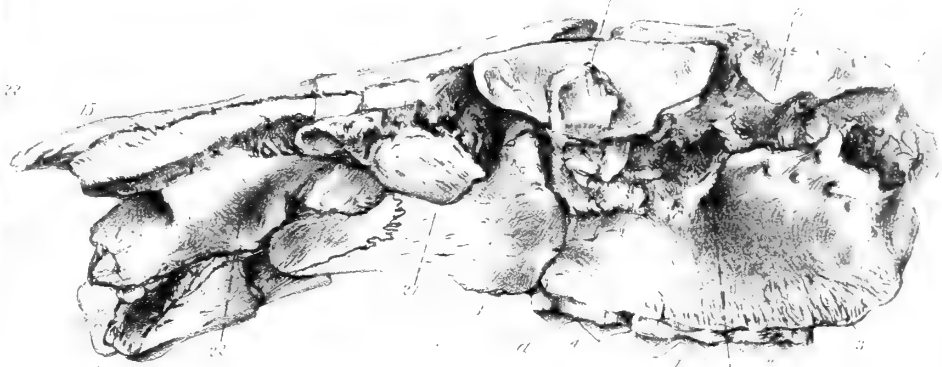


Fig. 2

Fig. 8

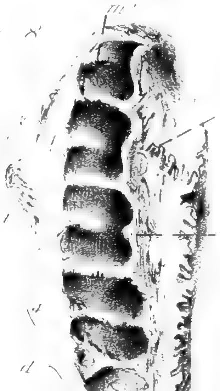


Fig. 5

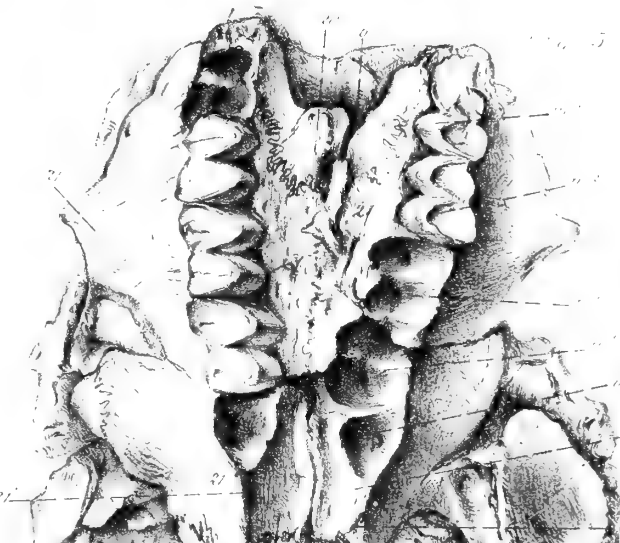
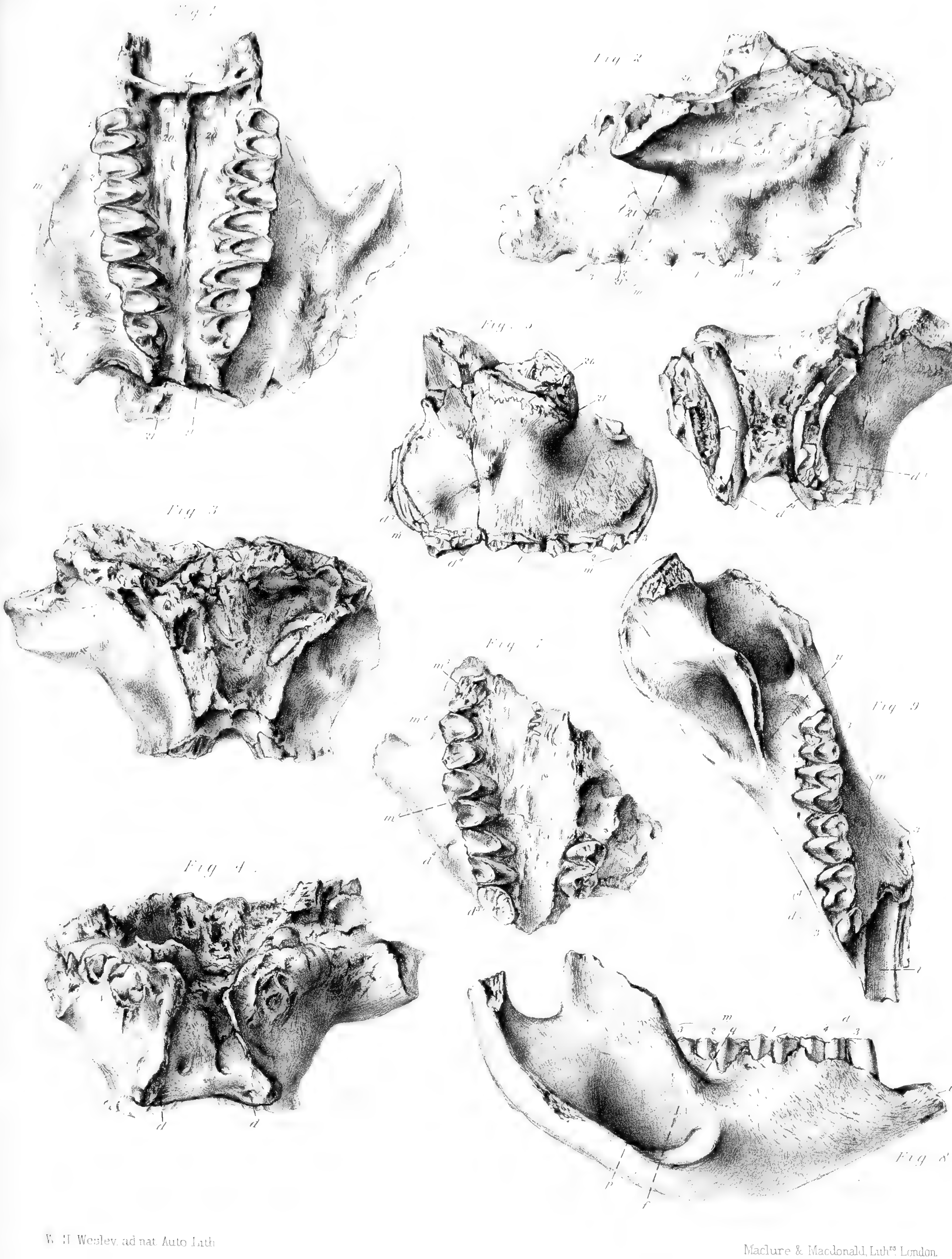


Fig. 6

Fig. 7

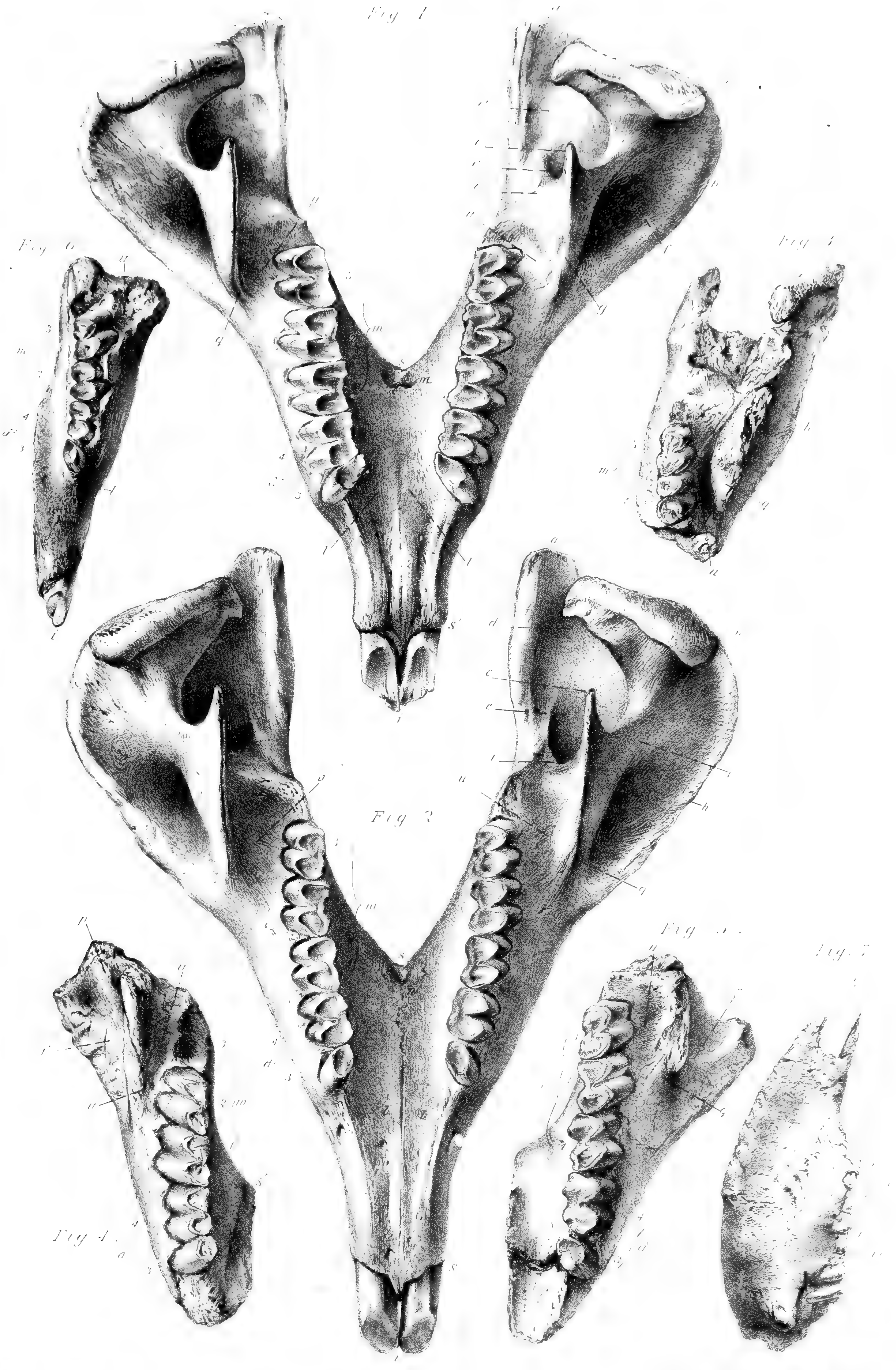
W. H. Wesley ad nat. Auto Lith

Maclure & Macdonald Lith^rs London

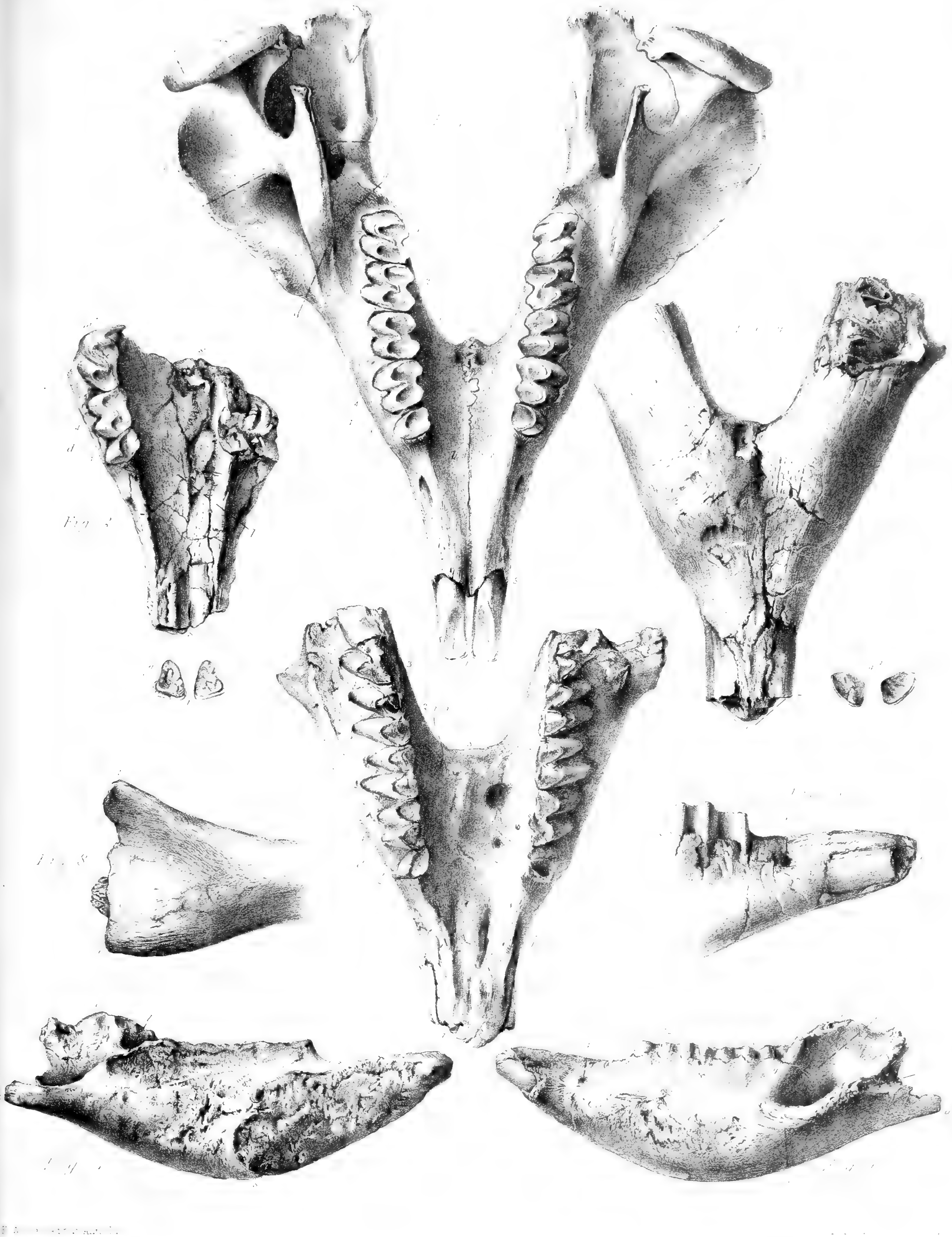


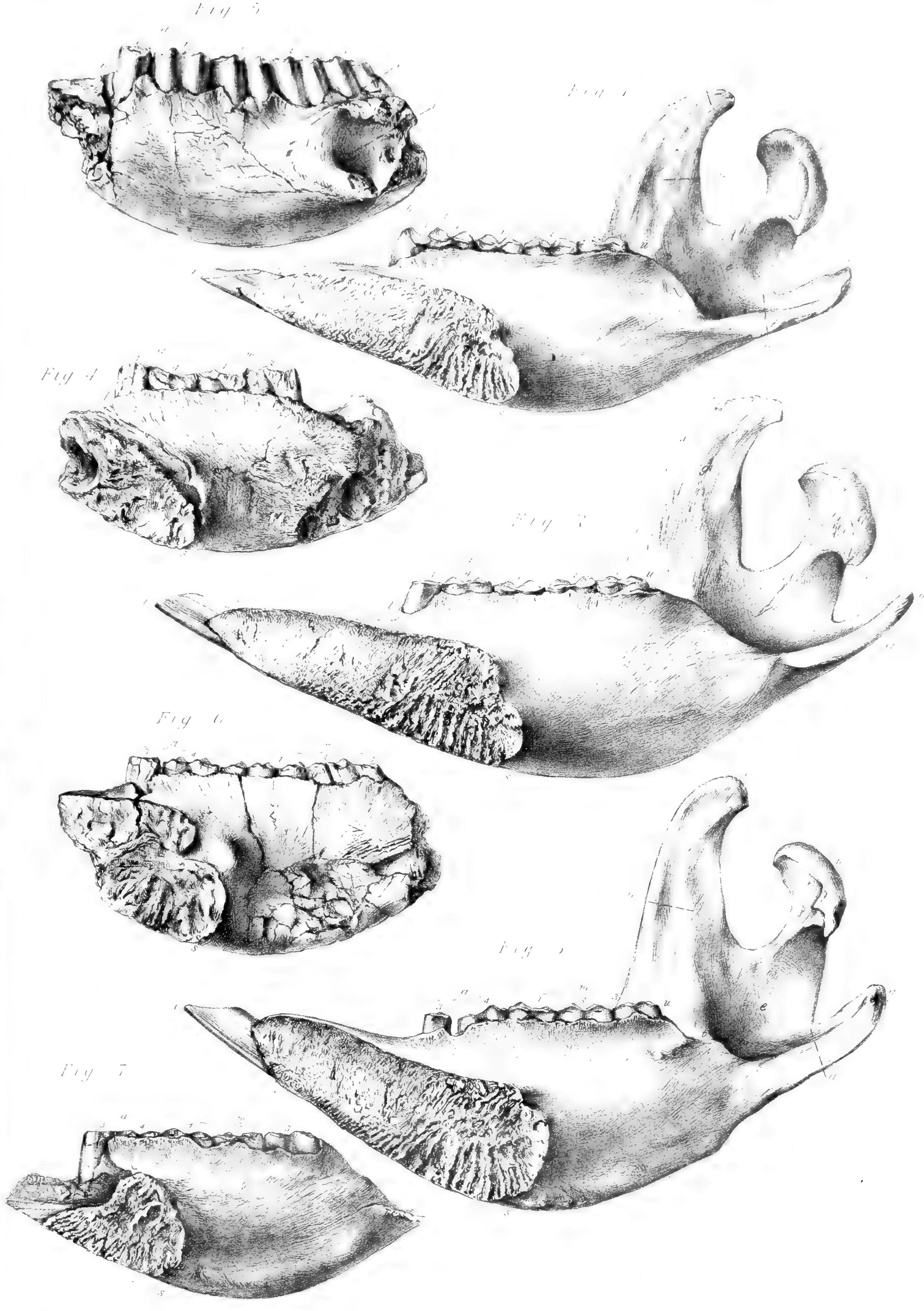
W. H. Wesley, ad nat. Auto Lith.

Maclure & Macdonald, Lith^rs London.

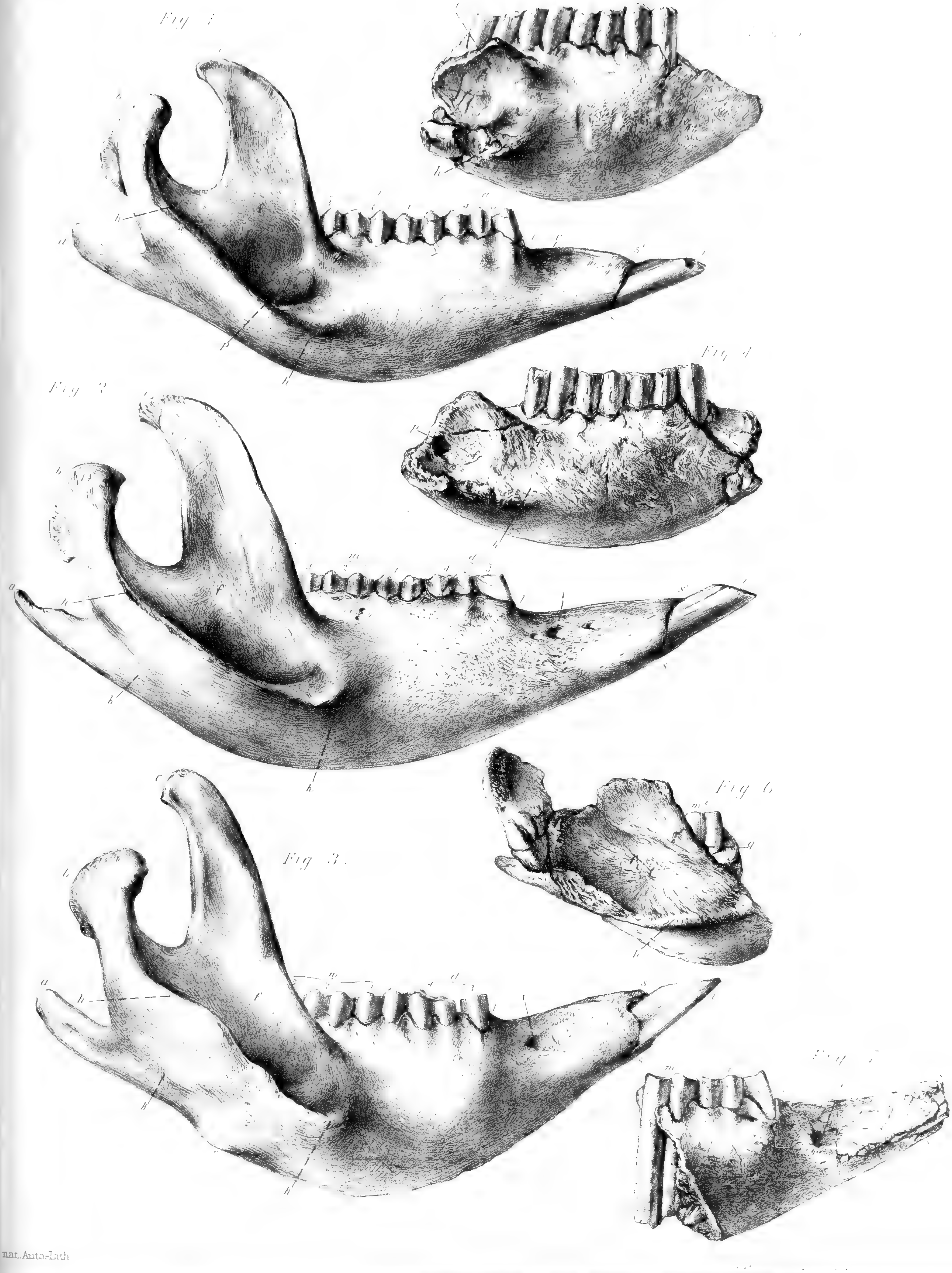


W. H. Wesley ... Auto-lith.





W. H. Wesley, ad nat. Auto-Lith.



nat. Auto-Lith

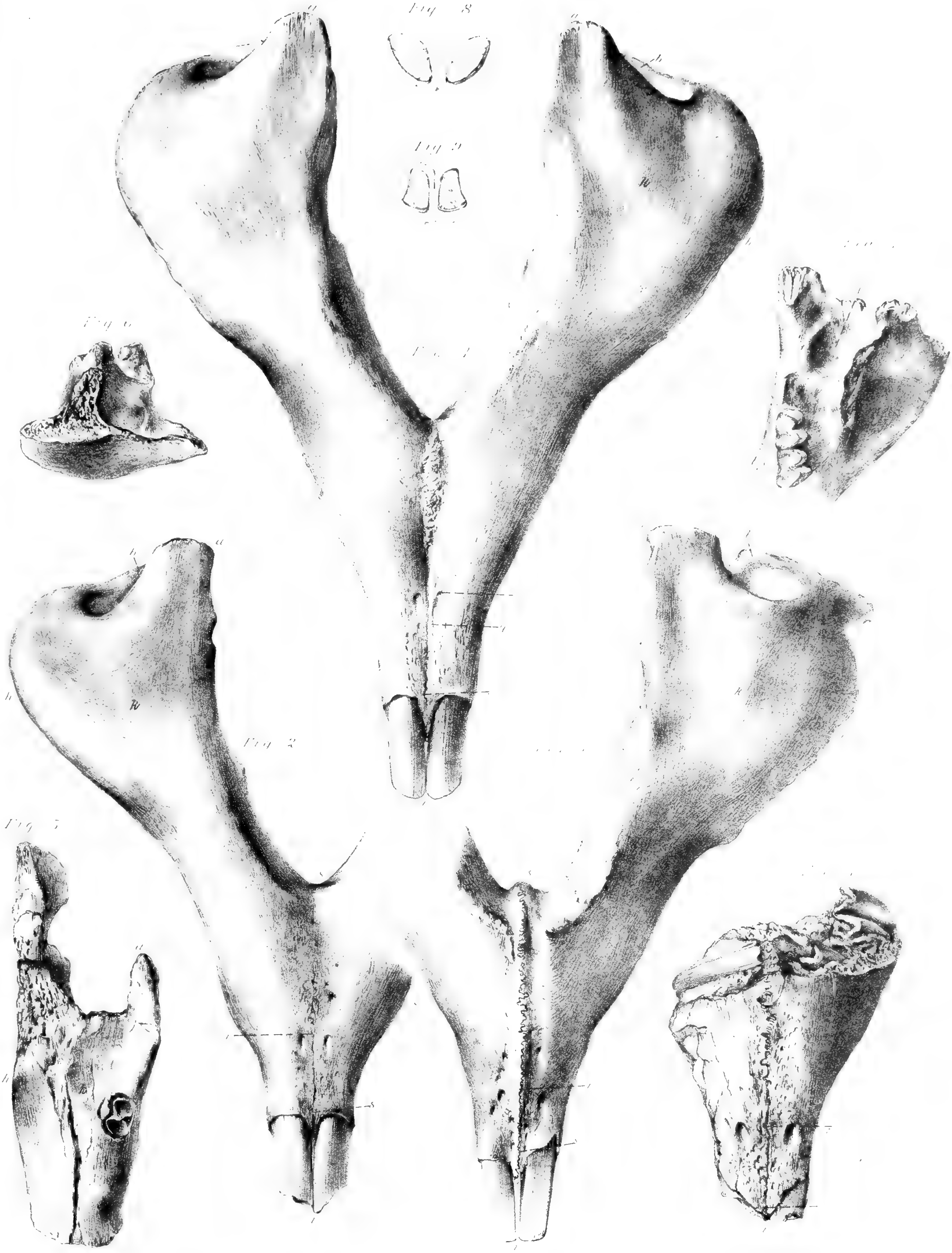


Fig 8
Fig 9
Fig 6
Fig 2
Fig 7

Dr. Jackson, of Boston, U.S.

in remembrance of friendly visits

to the Author,

Richd. Owen

September, 1873.

XI. *On the Fossil Mammals of Australia.*—Part VII. *Genus* Phascolomys: *species exceeding the existing ones in size. By Professor* Owen, *F.R.S. &c.*

Received March 25,—Read April 18, 1872.

In a former communication* I applied the cranial, mandibular, and dental characters of the existing species of Wombat to the determination of the fossil species resembling them in size; in the present are given the results of an easier task, viz. the determination of extinct Wombats of markedly superior size to any now living; and I shall describe the fossils as the species they represent progressively predominate in bulk.

§ 1. *Phascolomys medius*, Ow.—This species is represented by a lower jaw, fractured at both ends, presented by Sir Charles Nicholson, Bart., to the Geological Society of London; also by the fore part of the upper jaw of two individuals and by the right ramus, fractured at both ends, of the lower jaw, obtained by Edward S. Hill, Esq., from freshwater deposits exposed in the bed of a tributary of the Condamine River, at Eton Vale, Queensland: the latter were submitted to me in 1865, and have been liberally presented, with other Queensland fossils, to the British Museum by Sir Daniel Cooper, Bart. All these fossils are in the usual heavy, petrified, rolled, and more or less mutilated condition of such remains from the above formation and locality.

The first to be described (Plate XXXII. figs. 2–7) consists of so much of the premaxillary (22) and maxillary (21) bones as includes the sockets of the incisors (i) and of the first three molars (d_3, d_4, m_1, fig. 2), with part of that of the fourth, m_2. The incisors are broken off at the level of their alveolar outlets (fig. 6, i); the first and second molars, left side, show their natural grinding-surface; part of that of the following tooth is broken; the rest of the molars are more or less mutilated or wanting.

The superiority in size of the present extinct species to the two largest of the existing Wombats will be seen by comparing the above-cited figures, especially fig. 2, Plate XXXII., with the corresponding parts of the skull of *Phascolomys latifrons* (ib. fig. 1) and of *Phascolomys platyrhinus* (Plate XXXIII. fig. 1); it needs not to introduce the smaller Tasmanian Wombat into the comparison.

The following admeasurements give the degree, or value, of the character from the size of teeth and extent of diastema of the species above cited:—

	P. medius.		*P. platyrhinus.*		*P. latifrons.*	
	inches.	lines.	inch.	lines.	inch.	lines.
Antero-posterior extent of grinding-surfaces of d_3, d_4, m_1	1	6	1	2	1	0
Antero-posterior extent of diastema (l to i) . .	2	6	1	7	1	9

* Philosophical Transactions, 1872, p. 173.

In the relative length of the interval between the socket of the incisor (Plate XXXII. fig. 2, *i*) and that of the anterior molar (d_3), the present fossil resembles the latifront species (ib. fig. 1, *l*, $_{22'}$, *i*). The same relationship is shown in the form of the intermolar part of the bony palate, which is less contracted anteriorly in the fossil than in the bare-nosed Wombats (*Phascolomys platyrhinus*, Plate XXXIII. fig. 1*). The entire bony palate is more concave transversely in the hairy-nosed Wombat than in the other recent kinds; and this character is more strongly marked in the fossil, especially in the depth of the diastemal palatal tract into which open the "incisive" or premaxillo-maxillary palatal foramina (Plate XXXII. fig. 2, *a*, *a*). This deeply arched form of the bony roof of the mouth will be again noted in larger extinct species of Wombat.

The present appears to have been one half larger than the largest individuals of *Phascolomys platyrhinus*. In a specimen of this existing species, the length of the diastema equals three fifteenths of that of the entire skull, which is 7 inches 5 lines (Plate XXXIII. fig. 1, $_{21'}$, $_{22'}$). If the diastema bore the same proportion in *Phascolomys medius*, the length of its skull may be set down at 1 foot 6 inches.

The first molar (Plate XXXII. fig. 2, d_3), with the usual curvature, concave outward, and with the exposed part inclined obliquely backward, has a grinding-surface, or transverse section, of an oval form, with the small end forwards. The long diameter is 5 lines, and is in the direction of the molar series; the greatest transverse diameter is 4 lines. The enamel does not extend from the inner surface so far outward upon either the front or back parts of the tooth as in the recent Wombats; it shows no trace of the antero-internal fold which is feebly marked in *Phascolomys latifrons*, and strongly marked in *Phascolomys platyrhinus* and *Phasc. vombatus*. The coat of cement covering the outer side of the tooth is continued in a thinner layer over part of the enamel, and where absent has been probably accidentally removed from that partial deposit of the hardest dental tissue.

The second molar (ib. d_4) is divided by the usual deep inner groove and shallow outer one into two lobes, the hinder one being broader both transversely and from before backward. The antero-posterior extent of the grinding-surface is $7\frac{1}{2}$ lines, the transverse extent of the front lobe is 4 lines, of the hind lobe $4\frac{1}{2}$ lines; the inner end of this lobe is less obtusely rounded than that of the front lobe. From the unequal depth of the outer and inner alveolar walls, only a small part (about a line) of the unenamelled outer part of the tooth projects from the socket, while an extent of four lines of the inner enamelled part of the tooth projects beyond the lower inner alveolar wall (Plate XXXII. fig. 7, d_4). The enamel-coat is thinner at the bottom of the inner inflection or groove, and terminates near the rounded external angles of the tooth: portions of the thin cement covering the enamel are preserved.

The third molar (ib. fig. 2, m_1) resembles d_4 in size and shape; the anterior lobe does not extend so far inward as the contiguous lobe of the antecedent molar. The portion of the anterior lobe preserved of the fourth molar (m_2) shows the same relative

* See also Trans. Zool. Soc. vol. ii. plate lxxi. fig. 6 (*Phascolomys vombatus*).

position to the hind lobe of m_1. The enamel in all the molars is longitudinally striate, the striæ being feebly marked and subrugose.

Completing the upper molar series according to the analogy of *Phascolomys latifrons*, its antero-posterior extent would be about 2 inches 8 lines; and this is the extent shown in a photograph (Plate XXXV. fig. 7), nat. size, of a portion of the upper jaw of *Phascolomys medius*, with the entire molar series of the right side, from the breccia-cave of Wellington Valley, New South Wales, in the Australian Museum, Sydney, for which I am indebted to the Trustees of that Museum and their able Curator, Mr. Krefft.

The margin of the diastemal part of the upper jaw (Plate XXXII. fig. 2, *l*) is sharp to near the incisive outlets (*i*), where it broadens and becomes obtuse. The cross section of the incisor (ib. fig. 6) is a transverse oval, 6 lines in long diameter, $4\frac{1}{2}$ lines in short diameter; the small end of the oval is obtuse and turned outward. The enamel bends from above a very short way down upon the inner side or large end of the oval; it arches down over the small end. The enamelled surface of the tooth is more convex than the hind or lower cement-clad surface; but this is more convex, or less flattened, than in *Phascolomys latifrons*. The long and short diameters of the transverse section of the incisor in the other two living species are in opposite directions to those in the present fossil and the Latifront Wombat.

In *Phascolomys medius* the malar process of the maxillary (Plate XXXII. fig. 3, $_{21^*}$) rises thirteen lines above the alveolus of the third molar: the intervening wall of the maxillary is moderately concave vertically; in the smaller living Wombats it is convex; but in the character of height of origin of the process we again have an evidence of affinity to the latifront species. The photograph (Plate XXXV. fig. 7) shows a close correspondence with the fossil in this character.

The prezygomatic ridge (Plate XXXII. fig. 3, *m*) is low and broad, but in course and length resembles that in *Phascolomys latifrons*; in *Phasc. platyrhinus* this ridge is shorter, relatively thicker, and more prominent. Anterior to the ridge and the socket of d_3 the maxillary part of the skull of *Phasc. medius* contracts transversely, seemingly more suddenly than in existing Wombats, to form the diastemal part of the upper jaw. The maxillo-premaxillary suture runs vertically, with a sinuous and strongly denticulate course, about 5 lines in advance of the socket of d_3. The front walls of the incisive sockets (Plate XXXII. figs. 3, 4, & 5, $_{22}$, $_{22}$) are relatively higher or deeper than in *Phascolomys latifrons*, in which they are relatively higher than in the bare-nosed Wombats. The contour of this part of the premaxillary is rather concave in the fossil.

The photograph above referred to (Plate XXXV. fig. 7) of the cave fossil shows the same depth and shape of the bony palate, and the same somewhat abrupt contraction of the diastemal part of the maxillary, as in the fossil (Plate XXXII. fig. 2) from Eton Vale.

These evidences of specific distinction, superadded to the marked superiority of size of *Phascolomys medius*, are acceptable; although the degree of constancy of size and shape of teeth in the three species of living Wombats would have justified an inference, from

the teeth alone of the present fossil, that a still larger Wombat than the platyrhine continental species had formerly existed in both Queensland and New South Wales.

As so much, however, depends on ascertained constancy of characters in the comparative work preliminary to determination of extinct species, I believe it will be acceptable to palæontologists to have a description and figures of a fossil of *Phascolomys medius* somewhat larger than the subject of Plate XXXII. figs. 2–7.

The fore-and-aft extent of the first three molars in fig. 2, Plate XXXIII., is 1 inch 11 lines; in fig. 2, Plate XXXII., the same dimension yields 1 inch 8 lines. The closer agreement, as to size, in all other parts of the two fossils leads me to regard the above dental difference as coming within the limits of age- or sex-variation. The present fossil has been more crushed than the former; the socket of d_3 may have been pressed forward a little way from that of d_4, and so have contributed somewhat to the above difference. It is singular how the post mortem or posthumous violence has operated so as to detach almost the same parts and proportion of the fore part of the skull from the remainder in both representatives of *Phascolomys medius*. Some transversely acting force has nipped in the maxillaries in advance of the sockets of d_3, breaking the diastemal from the alveolar part of the left maxillary and crushing it inwards; this, in the present fossil, has somewhat approximated the right and left anterior molars (d_3, d_4), and has converted the concavity of the palate at the hind part of the diastema into an angular cleft. But the fore part expands and conforms in character with that in the last-described fossil. The length of the diastema and the characters of its borders are the same. The differences mentioned are obviously accidental. Rather more of the anterior pier of the zygomatic arch is preserved on the left side of the present fossil (Plate XXXIII. fig. 3, $_{21*}$).

The first molar (d_3) and the incisors have the same shape as in Plate XXXII. Nearly the whole of the implanted part of the left incisor (i) is exposed in the subject of fig. 3, Plate XXXIII. The incisors slightly converge as they curve downward and forward to the outlets of their long sockets. The enamel shows the same longitudinal rugous striation as in the other fossil. In both the median ridge is shown along so much of the floor of the nasal passages as is exposed (ib. fig. 4, n). In fig. 6 is given an inside view of so much as is preserved of the molars of the left side, upper jaw, corresponding with that from the preceding fossil given at fig. 7, Plate XXXII.

With the two foregoing fossils I received from Queensland, through the same liberal and enlightened contributors of materials for the history of Australian marsupial fossils, the portion of mandible, with the entire molar series, figured in Plate XXXIV. figs. 1 & 2.

This fossil, from the size of the teeth and of the jaw supporting them, I refer to the same species as the upper jaw (Plates XXXII. & XXXIII.). It includes an extent of 5 inches of the right ramus, wanting both extremities, but with a symphysial portion of the left ramus (Plate XXXIV. fig. 2, r, $\ddot{i}$) adherent by matrix, though slightly displaced, showing that the joint (s) had not been obliterated.

The general curve of the lower contour resembles that of the mandible of *Phascolomys*

latifrons (Philosophical Transactions, 1872, Plate XXII. fig. 3). The anterior part of the origin of the coronoid (Plate XXXIV. fig. 1, *q*) bears the same relation to the penultimate molar, and is more advanced than in *Phascolomys platyrhinus*. The ectalveolar groove (ib. fig. 3, *u*) between this process and the last two alveoli is relatively narrower than in any of the living species. The fore part of the ectocrotaphyte depression (*f*), bounded below by the prominent outstanding ridge (*h'*, *h*, fig. 1), is less deep than in the bare-nosed Wombats, and is more gradually excavated, as in the hairy-nosed species.

The ramus maintains its depth (1 inch 10 lines) to the socket of the first molar (Plate XXXIV. d_3, figs. 1 & 2). The hind part of the symphysis (ib. fig. 3, *s*) is on the vertical parallel of the hind part of the second molar (d_4), being rather more advanced than in *Phascolomys latifrons* (Philosophical Transactions, 1872, Plate XXI. fig. 3, *s*), and much more so than in *Phasc. platyrhinus* (ib. fig. 2, *s*) or *Phasc. vombatus* (ib. fig. 1, *s*). The upper surface of the symphysis (Plate XXXIV. fig. 3, *l*) repeats the character of the opposed palatal part of the upper jaw (Plate XXXII. & XXXIII. 21', 22') in its degree of transverse concavity; and this, at the diastemal tract, is bounded by lateral ridges, sharper than those above; they indicate a slightly curved course as they advance, concave outward, so far as they extend in the fossil. These characters of the upper surface of the symphysis are most nearly repeated by *Phascolomys Krefftii* (Philosophical Transactions, 1872, Plate XX. fig. 2, *l*, *s*) amongst the smaller Wombats; but in that extinct species the symphysis extends back as far as it does in *Phasc. platyrhinus* or *Phasc. vombatus* (Philosophical Transactions, 1872, Plate XIX. figs. 1 & 2). In *Phasc. latifrons* the symphysis is shorter, more concave and more definitely bounded above than in the bare-nosed Wombats, but is not so much so as in *Phascolomys Krefftii*. The lower contour of the symphysis in *Phascolomys medius* rises at a less open angle with the axis of the ramus than in *Phasc. latifrons*, and still less so than in the bare-nosed species. The lower surface shows the pair of vascular outlets, of small size, 15 lines in advance of the hind border. The anterior outlet of the dental canal (Plate XXXIV. fig. 1, *v*) is relatively rather nearer the socket of d_3 than in the smaller fossil and recent Wombats. The vertical convexity of the outer wall of the ramus and comparative flatness of the postsymphysial inner wall are according to the generic type, and relate to the direction of convexity of the long, bent, deeply implanted, ever-growing molars.

The first molar (d_2, ib. figs. 1, 2, 3) has the usual generic small size and simple form, representing, as it were, like its homotype above, one half of the succeeding molars. The grinding-surface resembles that of the upper jaw in being suboval, with the long axis lengthwise. In this it differs from *Phascolomys latifrons*, *Phasc. Mitchelli*, and *Phasc. Krefftii*, in which that surface is subquadrate, and it resembles, rather, *Phascolomys platyrhinus*; but the larger end of the oval is at the fore part of the tooth in *Phasc. medius*, not at the hind part, as is usually seen in *Phasc. platyrhinus*. The fore part of d_3 in *Phasc. medius* shows a feeble longitudinal groove, as in *Phasc. latifrons*. The enamel, as usual, coats the outer and fore part of the tooth, but is not extended so far from the fore part upon the inner side as in *Phasc. latifrons*. There

seems to be a slight interruption in the course of the enamel at the middle of the fore part of the tooth, which I have noticed in some of the smaller Wombats. The enamel was coated by cement in the fossil.

The succeeding molars slightly decrease in breadth of grinding-surface from the third (m_1), the decrease being most marked in the hind lobe of the last molar. This character is more marked in *Phascolomys latifrons* than in *Phasc. platyrhinus.* The longitudinal extent of the series of five teeth in *Phascolomys medius* is 2 inches 6 lines, as against 2 inches 1 line in *Phasc. platyrhinus*, and 1 inch 8 lines in *Phasc. latifrons.*

The lower incisors of *Phascolomys medius* resemble in relative size those in *Phascolomys latifrons*, in which they are smaller than in the bare-nosed Wombats; but the shape of the transverse section in *Phasc. medius* is different (Plate XXXIV. fig. 4, *ï*); it gives a full ellipse, $4\frac{1}{2}$ by $3\frac{1}{2}$ lines, with the long axis almost vertical, but obliquely inclined from above downward and rather inward. The enamel is thin, and limited to the lower half of the long procumbent tooth. They are smaller, especially narrower transversely, than the upper pair, and in this respect resemble the lower incisors of the hairy-nosed, not the bare-nosed, Wombats.

From the proportions which the extent of the molar series bears to the length of the entire mandible in existing Wombats, I estimate that the lower jaw in the present extinct species must have been between 6 and 7 inches in length.

§ 2. *Phascolomys magnus*, Ow.—This species is founded on two portions of the upper jaw, one containing the entire molar series of both sides (Plate XXXV. figs. 1–4), the other retaining the second, third, and fourth molars of the right side. Both are from the freshwater deposits of Queensland. The less fragmentary specimen includes rather more than an inch of the diastema in advance of the molars, so much of the outer wall of both maxillaries as includes the malar process, and a small portion of the premaxillaries.

The extent of each molar series is 3 inches 6 lines; they run almost parallel with a slight curve convex outward: the least interspace between the right and left series, viz. at the fore part of the second molar (d_4), is 1 inch; the greatest, viz. at the hind part of the last molar (m_3), is 1 inch 6 lines; the interspace between the right and left anterior teeth (d_3) is 1 inch $2\frac{1}{2}$ lines.

Thus, as in *Phascolomys medius*, the disposition of the upper molars and general form of the intervening palate is after the type of the existing hairy-nosed Wombat; but the concavity, transversely, of the palate is even greater than in *Phascolomys medius*, and becomes still more marked at the diastemal region.

The malar process of the maxillary (Plate XXXV. fig. 2, 21^*) rises at the same elevation above the socket of the third molar as in *Phascolomys medius*, showing a variety amongst the larger extinct Wombats which has been noted in the smaller existing species†.

The prezygomatic ridge (ib. *m*) resembles, in its curved course, length, and narrowness, that in *Phascolomys latifrons.* The maxillary anterior thereto advances and bends

† Philosophical Transactions, 1872, p. 179, figs. 5 & 6.

in with a convexity lengthwise: in the latifront and other living species the bone is here concave in the direction of the skull's axis. As the maxillary in *Phascolomys magnus* proceeds to join the premaxillary, the convexity changes to a concavity, in which remains of the maxillo-premaxillary suture may be traced.

The diastemal border (ib. fig. 2, $_{21'}$) rises as it advances from the molar alveoli at a less open angle than in *Phascolomys medius*, in which, as in the recent species, it extends forward nearly on the same parallel with the line of the alveolar outlets.

A shallow channel marks the inner surface of the commencement of the diastemal border (ib. fig. 1, $_{21'}$), its course being from above obliquely forward; there is a feeble rising of the surface anterior thereto. The palate between the ridges is regularly arched, the span being 1 inch 6 lines, the depth or height of the arch 1 inch. The extent preserved just reaches the place of entry of the prepalatal or "incisive" foramina, showing from the nasal cavity the hind wall of those canals and the increased vertical extent of the free inner surface of the premaxillary, making the sudden deepening of this part of the palate when viewed from below in such specimens as have that part entire, such as the subjects of fig. 2, Plate XXXII., & fig. 2, Plate XXXIII. *a*, from the smaller extinct species, *Phascolomys medius*.

The fractured surface of the premaxillaries (Plate XXXV. fig. 5) exposes the incisors near the apical end of the long pulp-cavity, about 1 inch 3 lines above the diastemal ridge: the premaxillary increases in thickness as it rises to form the alveolus. The upper fractured surface of the present fossil (Plate XXXV. fig. 4) exposes part of the floor of the nasal passages, gradually descending as they retrograde toward the place of the post-palatine apertures. Most of the intermolar floor of these passages and roof of the mouth has been broken away.

On each side of the nasal passages appear the hollow implanted ends of the molar teeth. That of d_3 (fig. 4) projects above the prezygomatic ridge, that of d_4 between this and the front pier of the zygoma ($_{21*}$); and the relative position of the rest conforms with the generic type of these singular elongate, outwardly curved, ever-growing teeth.

The total length of the first and smallest, following the curve, is 2 inches 9 lines. The long diameter of the oval or subtriangular grinding-surface is 6 lines; the breadth near the base, which is backward, is 5 lines. The inner enamelled side extends forward, with a very slight outward bend, from the axial line of the skull to the apex, which is narrow and obtuse, and round this the enamel bends for a short way along the outer side of the tooth; this is the longest side, and curves from behind forward and inward to the apex more strongly than does the inner side. The enamel can be traced from the inner side over the greater part of the hind surface of the tooth. The coat of cement covering the outer side of the tooth can be traced over parts of the enamel, the whole of which it seems originally to have covered.

The grinding-surface of the second molar (d_4) gives 9 lines in fore-and-aft diameter, 6 lines across the hinder lobe; that of the third molar (m_1) has the same longitudinal

with rather less transverse extent; and the two succeeding teeth diminish, chiefly in transverse thickness. The grinding-surface of the last molar (m_3) has a fore-and-aft extent of $6\frac{1}{2}$ lines, with a transverse diameter at the hind lobe of but 3 lines. In shape, implantation, and structure, showing interruption of the enamel coating at the outer side, these upper molars closely adhere to the generic character of *Phascolomys*. The exposed implanted ends show the widely open persistent pulp-cavities. The section of the base of the right incisor has a transverse diameter of 6 lines, a vertical one of $5\frac{1}{2}$ lines. The upper, which would become the front surface, is transversely convex; the under surface is transversely concave, but irregularly so, from the greater production downward of the inner angle. The upper incisor appears, from the present remnant of it, to differ in shape as well as size from that of *Phascolomys medius*. The inner interspace between the pair at the place of fracture (Plate XXXV. fig. 5) is 7 lines; they no doubt converged as they descended to come into contact at their exposed and working ends.

The above-described fossil is from a full-grown and seemingly old individual.

I am glad, however, to have another example of the size of teeth which typifies *Phascolomys magnus*. It is afforded by a fragment of the right maxillary, with the second, third, and fourth molars *in situ*, and portions of the sockets of the first and fifth.

The antero-posterior extent of the grinding-surfaces of the three teeth in place is 2 inches 4 lines, according in all dimensions and in relative size with those in the subject of figs. 1–4, Plate XXXV. The outer surface of the bone shows the same relative position of the malar process of the maxillary, the same shape and course of the prezygomatic ridge, so far as it is preserved. Part of the malar bone contributing to the fore part of the orbit is also here preserved; but the fragment has been much rolled and worn, and is incrusted with the petrified lacustrine deposit.

In both specimens the enamel has a finely reticulate surface, with a tendency to longitudinal striation. This surface aids the attachment of the cement.

Amongst the detached teeth worked out of the portions of breccia from the Wellington-Valley bone-caves transmitted to the British Museum was one entire molar tooth and the halves of two others (Plate XXXV. fig. 6), of the size of those of *Phascolomys magnus*. The entire molar corresponds closely with the third, upper jaw, left side, in the specimen last described from Darling Downs (ib. fig. 1, m_1). We thus get evidence of the former range of *Phascolomys magnus* over some hundreds of miles of the Australian continent.

§ 3. *Phascolomys gigas*, Ow.*—Of the lower jaws of Wombats exceeding in size that of *Phascolomys medius* (Plate XXXIV.), I have seen none with a molar series having the same relative size to the upper one in *Phascolomys magnus* (Plate XXXV.) which the teeth of the lower jaw bear to those of the upper one in existing Wombats, and in all the extinct species of which I possess means of comparing those teeth.

A series of lower molars with an extent of grinding-surface of 4 inches 3 lines (Plate

* Art. "Palæontology," Encyclopædia Britannica, 1858, vol. xvii. p. 175. fig. 114.

XXXVI. fig. 3) cannot have worked, in the same head, upon an upper series of only 3 inches 6 lines (Plate XXXV. figs. 1 & 3). The anterior molar of the lower or movable jaw in *Phascolomys medius* (Plate XXXIV. fig. 2, d_3) has a somewhat smaller extent of grinding-surface, as in all existing Wombats, than the corresponding tooth of the upper or fixed jaw (Plate XXXII. fig. 2, d_3, and Plate XXXIII. fig. 2, d_3). The smallest example of d_3 in the remains of large Wombats yet to be described gives 9 lines and $4\frac{1}{2}$ lines as the two diameters of its almost elliptical grinding-surface (Plates XXXVI. & XXXVII. d_3). Such a tooth cannot have belonged to the same species as the one which has an upper anterior molar with the dimensions above given as characteristic of *Phascolomys magnus* (Plate XXXV. d_3).

Of this species the lower jaw and teeth have not yet come under my observation. All the examples of the large extinct Wombats now before me for description belong to the species *Phascolomys gigas*, of which the grinding-surface of a lower molar is figured in the "Article" quoted above, and in my 'Palæontology' (p. 431, fig. 172, 2nd ed. 1861); the former existence of which Wombat I noticed, some years before, in my second memoir "On the Osteology of the Marsupialia"*.

Satisfactory evidence of this species has since reached me, of which I propose, first, to describe a considerable proportion of the mandible, obtained by Edward S. Hill, Esq., from a freshwater deposit at Eton Vale, Darling Downs, in 1863, and presented by Sir Daniel Cooper, Bart., to the British Museum.

It consists of the right ramus (Plate XXXVI. fig. 1) with the fore part broken off near the socket of the first molar (d_3), and with some mutilation of the outstanding parts of the ascending ramus; also of the fore part of the left ramus (ib. fig. 2), with the hind part broken off at the socket of the penultimate molar (m_2). They are both parts of the same mandible, and I have therefore supplied, in the subjects of Plate XXXVI. fig. 2, Plate XXXVII. fig. 1, and Plate XXXVIII. fig. 1, from one ramus what was wanting in the other.

Reference to Plate XXII. Phil. Trans. 1872, where the side view is given of the mandible in the three known living species of *Phascolomys*, will make at once appreciable the character of the present extinct Wombat, in the minor relative antero-posterior extent of the ascending ramus, and its greater relative height before dividing into the condylar (*b*) and coronoid (*c*) processes. The intervening notch sinks nearly to the level of the grinding-surface of the molars in the recent and smaller extinct Wombats; whereas in *Phascolomys gigas* the common plate (*f*, *g*) rises much higher before dividing into *b* and *c* (Plate XXXVI. figs. 1 & 2). The fore-and-aft extent of the rising branch at the neck of the condyle equals in extent that of the last four molars in *Phascolomys platyrhinus*,

* Trans. Zool. Soc. vol. iii. p. 306, 1845:—"I have recently obtained evidence from the postpliocene deposits of the district of Melbourne, through the kindness of my friend Dr. Hobson, of an extinct Wombat, or true *Phascolomys*, at least four times as large as either of the known existing species." These were *Phascolomys vombatus* and *Phascolomys latifrons*; the somewhat larger continental Wombat (*Phascolomys platyrhinus*) had not then been determined.

and rather more in *Phascolomys latifrons*; in *Phascolomys gigas* the same dimension equals only the last two molars and half of the antepenultimate one.

The ectocrotaphyte ridge (Plate XXXVI. fig. 1, *h*, *h*) is relatively more prominent and the depression (*f*) which it circumscribes below is relatively deeper in *Phascolomys gigas* than in either the Platyrhine or Tasmanian Wombats, and the intercommunicating vacuity is relatively wider in the gigantic Wombat, in which its long diameter is 9 lines. The neck of the condyle at its origin (*b*) is but 9 lines across; it expands to a breadth of more than an inch where the condyle has been broken off. The base of the coronoid process (*c*) has an antero-posterior extent of 1 inch 3 lines; the anterior margin continued into that of the rising ramus subsides upon the outer surface of the jaw (*q*) below the socket of the penultimate molar (m_2).

The lower contour of the mandible (Plate XXXVI. figs. 1 & 2) describes a strong convex uninterrupted curve to the fractured diastemal part, herein resembling rather the latifront, or hairy-nosed, than the bare-nosed Wombats.

The inflected angle (Plate XXXVIII. fig. 1, *a*) begins, posteriorly, at a lower level than the ectocrotaphyte plate (ib. *h*), as in existing Wombats, but it has a minor relative extent; that of its base, as defined anteriorly by the "mylo-hyoid groove" (Plate XXXVI. fig. 2, *w*), does not exceed 2 inches; consequently the superangular cavity (*e*) is relatively small. The dental canal (Plate XXXVII. fig. 4, *o*) begins as a wide transverse fissure, internal to which is the large vacuity above mentioned leading to the ectocrotaphyte fossa. The postalveolar ridge (ib. *t*) forms a low angle as it bends to the superangular fossa. The ectalveolar groove (ib. *u*) is relatively narrow.

The depth of the horizontal ramus augments more rapidly to the back part of the symphysis (Plate XXXVI. fig. 2, *s*) than in recent or smaller extinct Wombats; from being 2 inches behind the last alveolus it grows to 3 inches 3 lines below the interval between the penultimate and antepenultimate alveoli. The smooth thick lower border shows prominences indicative of the matrices of the hinder molars, the bone being here reduced to extreme thinness. The symphysis begins behind at a vertical line dropped from the interspace between m_1 and m_2; it has been partially obliterated, the separation of the rami here being attended with fracture of the confluent portion. This indicates an aged animal. The hinder and upper border of the symphysis is divided into two curves by the encroachment of the smooth inner surface of the ramus a little below the swelling (i^*) indicative of the closed and formative end of the socket of the incisor. The interlocking rough narrow ridges of the joint show the usual tendency to radiate from above downward. There are two anterior outlets of the dental canal (in the subject of Plate XXXVI. fig. 1, *v*) on the same vertical line, about half an inch in advance of the alveolus of d_3 and near the diastemal margin.

The length of the "ascending ramus" before dividing into the condylar and coronoid processes shows a resemblance in the gigantic Wombat to the large herbivorous Notothere and Diprotodon, which is not seen in the smaller species of *Phascolomys*. The bold curve of the lower contour of the "horizontal ramus" in *Phascolomys gigas* recalls

that feature of the mandible of the Megathere, and it has a like relation to the lodgement of the formative matrices of long, ever-growing molars *.

The first molar (ib. figs. 1 & 3, d_3) is subbilobed, through opposite longitudinal shallow grooves equally dividing the tooth. The tendency to a gain of grinding-surface in the direction of the jaw's axis seen in the same tooth of *Phascolomys medius* is in the larger species carried further, so as to substitute for the representative of one half or lobe of the succeeding molars in the anterior one of smaller Wombats a more simplified condition of the normal bilobed phascolomydian type of molar. The enamel of d_3 in *Phascolomys gigas* is continued from the outer over the front side, and along nearly the whole of the hind side of the tooth. A coat of cement of similar thickness covers the inner side, and is continued more thinly upon the enamel. The surface of the enamel is longitudinally rugoso-striate.

All the succeeding molars have a partial coat of enamel, extending from the outer side upon the fore part to where this comes into contact with the antecedent tooth, and continued, perhaps, a little further upon the hind surface. The rest of the dentine has the coating of cement. The proportions of the several teeth are shown in the figures above cited.

As before remarked, the smaller size of the last molar indicates the Latifront Wombat to be nearer akin to the extinct giant than are the bare-nosed living species. The same affinity is shown by the small size of the lower incisors in *Phascolomys gigas* (Plate XL. figs. 1, *ï*, 2, 3, 4). They are smaller, especially narrower, in *Phascolomys latifrons* than in *Phasc. platyrhinus* and *Phasc. vombatus*, and are, relatively, still smaller in *Phasc. gigas*, with a distinctive shape. But the characters of the lower pair of incisors are better shown in another mandibular specimen of the present large species.

The section or transverse fracture of the hollow base of the right incisor is shown in Plate XXXVII. fig. 2, *i*; the length and curvature of the implanted part of the second molar (d_4) are seen in the same figure, in which *e e* indicates the anterior terminal line of the outer enamel. The hinder fracture of the left ramus of the same jaw (ib. fig. 3) shows the length and curve of the penultimate molar (m_2), and the posterior terminal line of its partial covering of enamel (*e*).

Of the above-described instructive specimen of *Phascolomys gigas* little more than an inch of the diastemal part of the jaw is preserved (Plate XXXVI. figs. 1 & 2, *l*). Fortunately, the first specimen which made known to me the fact of so large a Wombat having formerly existed in Australia included 2 inches 8 lines of the diastemal part of the jaw, which contracts rapidly to the terminal outlets of the incisive alveoli (Plate XXXIX. figs. 1 & 2); whence I conclude that but little had been broken away from that end of the mandible.

* Should any successor deem the differential characters of the giant Wombat of generic or subgeneric value, as the minor differences of *Phascolomys latifrons* have been by Dr. Murie (Proc. Zool. Soc. 1867, p. 815), they may, perhaps, accept the name '*Phascolonus*,' having reference to the size of this species, which equalled that of the Wild Ass.

The subject of Plate XXXIX. figs. 1, 2, 3 was obtained from "a salt-lake, nearly 100 miles west of Melbourne," and was transmitted to me by Dr. HOBSON*. It is the symphysial end of the mandible, with $4\frac{1}{2}$ inches of the joint (s, s'), the obliteration of which indicates the age of the individual; it includes the implanted parts of the incisors (i'), and of the three anterior molars of each ramus (fig. 1). The under part of the symphysis (fig. 2, Plate XXXIX.) shows the pair of subsymphysial foramina (r) in the same relative position as in the existing Wombats (ib. fig. 4, r). The prolongation of the attenuated anterior end of the mandible shows a nearer resemblance in *Phascolomys gigas* to *Phascolomys latifrons* (Phil. Trans. 1872, Plate XXIII. fig. 3) and *Phascolomys Krefftii* (ib. Plate XX. fig. 2) than to *Phascolomys platyrhinus* (ib. Plate XIX. fig. 2) or to *Phascolomys vombatus* (ib. fig. 1). The upper surface of the specimen (Plate XXXIX. fig. 1) shows the same concavity between the right and left anterior molars as in the more perfect specimen of *Phascolomys gigas* (Plate XXXVII.). The hollow implanted ends of the incisors (Plate XXXIX. figs. 1 & 3, i'), exposed by fracture of the fossil, hold the same relative position to the third molars (m_1) as in the more complete mandible. The anterior outlets (ib. fig. 1, v, v) of the dental canal are in the same position.

The subject of fig. 5, Plate XL., shows a slight inferiority in the size of the molar teeth as compared with that of figs. 1, 2, & 3, Plate XXXVI. The present fossil is a portion of the left ramus with the last four molars in place. The longitudinal extent of their grinding-surfaces is 3 inches 5 lines (Plate XL. fig. 5), as against 3 inches 6 lines (Plate XXXVI. fig. 3); that of the first three molars is the same in both specimens, and the difference is due to a smaller size of the last molar in the present (Plate XL. fig. 5, m_3), the hind lobe of which also shows a longitudinal indent. I am unwilling to regard this as signifying more than a variety of *Phascolomys gigas.* The features of the mandible, such as the anterior origin of the ectocrotaphyte ridge (ib. fig. 6, h), and of the ascending ramus (ib. fig. 6, q), as also the ectalveolar groove (ib. fig. 5, u) and postalveolar ridge (ib. ib. t), so far as they are preserved, closely resemble those of the more complete specimen of mandible of the present large species.

The fourth example of *Phascolomys gigas* I know through a cast and photograph of the original, now in the Australian Museum, Sydney, New South Wales. The cast was prepared by direction of the Trustees of that Museum, and was transmitted as a donation to the British Museum. A photograph of the natural size, showing the grinding-surface of the molar teeth, was forwarded to me through the same liberality. The specimen is a portion of the right ramus, including the series of five molars and the entire incisor (Plate XL. figs. 1–4), of which tooth a separate cast was prepared and transmitted. The molars show a slight superiority of size over those in the subject of Plate XXXVI., as may be seen by comparison of figs. 3 & 4 in that Plate; but this I take to be within the limits of individual or sexual range of size. The configuration of the ramus, so far as the comparison can be made, closely resembles that of the more complete mandibles of the present species (Plates XXXVI., XXXVII., & XXXIX.): the portion of the

* Letter from Dr. HOBSON, March 3rd, 1844.

ectocrotaphyte cavity preserved in the present cast indicates the same depth; the symphysial articular surface (Plate XL. fig. 1, s, s') has the same shape and extent; the molar teeth (ib. fig. 1, d_3, d_4, $m_{1,2,3}$) show the same configurations and proportions of their grinding-surface (Plate XXXVI. fig. 4)—the extent of the series is 4 inches 7 lines. The length of the incisor (Plate XL. figs. 1, i, & 2) is 7 inches, its vertical diameter is 8 lines, its transverse diameter 6 lines. The section of the tooth (ib. fig. 4) is lozenge-shaped, with the four angles rounded. The lateral angles (e, e') are nearer the upper (u) than the lower (o) angles, and the lower inner facet (g) is broader than the lower outer one (h); the convergence of the two broad lower facets to the obtuse lower angle makes that part of the incisor the narrowest or smallest: if the angles were rounded off, the shape of the transverse section would be an oval with the large end upward. The upper and inner angles are less rounded and more marked than the outer and lower angles. Two low narrow ridges traverse lengthwise the inner and lower facet (ib. fig. 1, g, g), dividing it into three tracts, the lowest being the narrowest; the outer and lower facet (ib. fig. 2, h, h) is slightly hollowed. A thin layer of enamel coats the lower and lateral parts of the tooth up to the lateral angles (e, e'), where it subsides abruptly after becoming thinner than it was below.

The base of the incisor in the left ramus of the first-described jaw of *Phascolomys gigas* (Plate XXXVI. figs. 1 & 2, i, and Plate XXXVII. fig. 2, i) repeats the characters above given from the cast of the entire incisor, the original of which is in the Australian Museum; the outer lateral angle is more sharply marked at the implanted part of the incisor compared.

The contrast in the shape and relative size of the incisor of the giant Wombat with that of the largest known living species (*Phascolomys platyrhinus*) is great. The section of the incisor in that species has an area double that of the section of the first molar; in *Phascolomys gigas* these proportions are almost reversed. The long diameter of such section of the incisor is transverse in *Phascolomys platyrhinus*; it is vertical in *Phascolomys gigas.* Amongst living Wombats an approach to the extinct giant is made by the *Phascolomys latifrons*, in which the vertical diameter prevails in the section of the incisor—only the large end of the oval, or base of the triangle, is below, not above as in *Phascolomys gigas*; and the area of the section in *Phasc. latifrons* rather exceeds that of the anterior molar, d_3. In the extinct *Phascolomys medius* (Plate XXXIV. fig. 4, i) we have a nearer approach to the characters of the lower incisors in *Phascolomys gigas.*

Another evidence of *Phascolomys gigas* is the hind part of the right mandibular ramus with a more mutilated "ascending branch" than in the subject of Plate XXXVI.; it includes the sockets of the last four molars and the base of that of the incisor. The teeth in this specimen must have presented the size of those in the subject of fig. 4 (ib.); the longitudinal extent of the last three sockets is 2 inches 10 lines. The hind fracture is at the intercommunicating canal (Plate XXXVII. fig. 4, p), exposing the wide beginning of the dental canal (ib. o), with its larger division continued along the outer side of the bases of the molar alveoli, and the smaller division (o') extending along the

inner side to emerge at the anterior dental outlet (*v*); the "mylo-hyoid groove" is broader and less deep than in Plate XXXVI. fig. 2, *w*. The characters of the ectalveolar groove, of the postalveolar ridge, and of the ectocrotaphyte fossa (*f*) agree with those of the type mandible of *Phascolomys gigas.*

The present specimen was discovered by M. SATCHE ST. JEAN, at St. Jean Station, Queensland, in the bed of a tributary creek of the Condamine River.

The last specimen which I have now to notice was obtained by F. NICHOLSON, Esq., from the same freshwater deposits at Clifton Plains, Darling Downs, Queensland. I am indebted to the kindness of Professor HARKNESS, of Queen's College, Cork, for the opportunity of here describing and figuring it. It either exemplifies the largest observed variety of *Phascolomys gigas*, or indicates a still larger species, *i. e.* one in which modifications of the shape of the jaw may be associated with its superiority of size. Of this the mutilated state of the fragment does not permit me to judge, and I am disposed to refer the specimen to a large old male of *Phascolomys gigas.*

The longitudinal extent of the outlets of the last three molars of Mr. NICHOLSON's fossil (Plate XXXVIII. fig. 4, $m_{1,2,3}$) is 3 inches 1 line; they show the same kind and degree of decrease of size from the first to the third as in the smaller examples of the species. The breadth and apparent depth of the ectalveolar groove (ib. figs. 3 & 4, *u*) are as in the first-described mandible (Plates XXXVI. & XXXVII.). The fore part of the base of the coronoid or ascending ramus (ib. fig. 3, *q*) and of the ectocrotaphyte ridge (ib. *h*) show likewise the same relative positions. On the inner fractured side of this specimen the large inner division of the dental canal is seen about 9 lines above the closed ends of the last two alveoli.

§ 4. *Conclusion.*—In the case of *Phascolomys*, as of most Mammalian genera, when due time and pains are applied to the acquisition and study of the fossil evidences, the number of species which have passed away is found to exceed that of the living ones which remain.

Until comparatively lately the Wombat was known to zoologists as a solitary exceptional form of small Tasmanian marsupial, peculiar in its scalpriform dentition combined with burrowing habits*. We now know this generic form under many specific structural modifications, and with gradations of bulk rising from that of a Marmot to that of a Tapir.

The rodent type of incisors, both as to number and kind, are retained in all, certainly in the lower jaw of the gigantic species; but it would not be safe to infer that the subjects of the present Paper burrowed like the smaller living Wombats.

If we knew the Hare (*Lepus timidus*) only by fossil remains, we should err in attributing to it the habits and mode of life of the smaller species, *Lepus cuniculus.* It is probable that the larger extinct Wombats did not conceal themselves under ground.

What we know is, that of the series of forms specifically varying the generic type of *Phascolomys* the larger ones have perished. Here, as in the case of the gigantic wingless birds of New Zealand, size and bulk seem to have been a disadvantage in the

* Hence the synonym, *Phascolomys fossor*, of WAGNER.

"contest for existence"*. The small burrowing Kivis†, like the small Wombats, have survived. *Phascolomys gigas* and *Phascolomys magnus* are not likely to have escaped observation if they still lingered in any of the localities made known by the adventurous explorers of Australia; but the diminutive *Phasc. parvus* may yet be found living in some part of that continent.

Another inference, or tributary illustration of a general law, is shadowed forth less plainly, perhaps, than that bearing upon the "battle of life."

The majority of the fossils of common-sized Wombats exemplify, as in the case of *Phascolomys Mitchelli*, the more generalized structure; osteological characters, now distinguishing respectively the hairy-nosed and bare-nosed Wombats, are combined in the skull of that extinct species. At the same time divergent courses of variation had reached the stages indicated by *Phascolomys latifrons* and *Phascolomys platyrhinus* at a period when the larger species, now extinct, appear to have been living in Australia. This is less ambiguously shown, as to time, by the mandible of the continental bare-nosed Wombat from Queensland, than by that of the hairy-nosed species from the breccia of the Wellington-Valley Caverns; for, with regard to specimens obtained from caves, there are grounds of uncertainty as to contemporaneity of introduction not affecting, at least in the same degree, the fossils from stratified deposits of known geological age.

The extirpating cause of the larger Wombats, especially if they were unable to take refuge and conceal themselves under ground, was probably the hostility of man. No human remains, however, or weapons have yet been discovered in the substalagmitic breccias of the caves or in the freshwater deposits of Australia. But as the unseen planet is inferred by evidence of its force, so may the destroyer be conjectured and his discovery anticipated by the effects of his power; such, *e. g.*, as the disappearance of species which, from their easier detection, capture, or bringing to bay, and greater profit when slain, would be the first objects of chase to the primitive Aborigines.

Table of Localities of Fossils of *Phascolomys*, showing:—

Where found.	By whom.	Date.	Species.
Breccia-cavern, Wellington Valley......	Sir Thomas L. Mitchell, C.B.	1836	*Phascolomys Mitchelli.*
Lacustrine deposits, Victoria	E. C. Hobson, M.D.	1845	*Ph. gigas.*
Lacustrine deposits, Queensland.........	Geo. Bennett, M.D., F.L.S.....................	1861	*Ph. Mitchelli.*
King's Creek, Darling Downs............	Mr. Turner	1847	*Ph. parvus, Ph. medius.*
Gowrie, Darling Downs	Fred. Neville Isaac, Esq........................	1861	*Ph. Mitchelli.*
Eton Vale, Darling Downs	Edward S. Hill, Esq.	1865	*Ph. platyrhinus, Ph. medius, Ph. magnus, Ph. gigas.*
St. Jean Station, Darling Downs	M. Satche St. Jean	1865	*Ph. gigas.*
Drayton, Darling Downs.................	Sir D. Cooper, Bart.	1864	*Ph. Thomsonii, Ph. medius, Ph. magnus, Ph. gigas.*
Clifton Plains, Darling Downs	F. Nicholson, Esq.	1866	*Ph. gigas.*
Breccia-cavern, Wellington Valley......	Prof. Thomson, and Gerard Krefft, Esq. ...	1867	*Ph. Mitchelli, Ph. Krefftii, Ph. latifrons, Ph. medius.*

* Owen, "On Dinornis," Part IV., Trans. Zool. Soc. vol. iv. (1850) p. 15.

† *Apteryx australis*, Shaw *Apteryx Owenii*, Gould.

Explanation of the Plates.

PLATE XXXII.

Fig. 1. Base of skull and working-surface of the teeth of the upper jaw, *Phascolomys latifrons.*

Fig. 2. Part of base of skull, with working-surface of some molar teeth, *Phascolomys medius.*

Fig. 3. Left side view of the same fossil.

Fig. 4. Right side of fore part of the same fossil.

Fig. 5. Front view of premaxillary part of the same fossil.

Fig. 6. Fractured surface of ditto, showing transverse section of the implanted part of the incisors, *i*, *i*.

Fig. 7. Inner side view of the crowns of the three anterior molars and fore lobe of the fourth molar of the same fossil.

PLATE XXXIII.

Fig. 1. Base of skull and working-surface of the teeth of the upper jaw, *Phascolomys platyrhinus.*

Fig. 2. Part of base of skull, with fractured and working-surface of some molar teeth, *Phascolomys medius.*

Fig. 3. Left side view of the same fossil.

Fig. 4. Posterior fractured end of the same fossil.

Fig. 5. Front view of premaxillaries and fractured incisors of the same fossil.

Fig. 6. Inner side view of exposed part of the three anterior molars and fore lobe of the fourth molar of the same fossil.

PLATE XXXIV.

Fig. 1. Outside view of portion of right mandibular ramus, *Phascolomys medius.*

Fig. 2. Inner side view of the same fossil.

Fig. 3. Upper view and grinding-surface of molar teeth of a mutilated mandible of *Phascolomys medius.*

Fig. 4. Front fractured end, with section of implanted part of the lower incisors of the same fossil.

Fig. 5. Hind fractured end of left ramus of the same fossil.

PLATE XXXV.

Fig. 1. Under view of part of upper jaw and molar teeth, *Phascolomys magnus.*
Fig. 2. Left side view of the same fossil.
Fig. 3. Inner side view of the right molars of the same fossil.
Fig. 4. Upper view of the same fossil.
Fig. 5. Anterior fractured surface of the same fossil, with sections of the base of the incisors, *i*, *i*.
Fig. 6. Third molar and hind half of second molar, *Phascolomys magnus*: the working-surface is shown below.
Fig. 7. Part of upper jaw, with molar teeth, *Phascolomys medius* (from a photograph).

PLATE XXXVI.

Fig. 1. Outside view of part of the right mandibular ramus and teeth, *Phascolomys (Phascolonus) gigas.*
Fig. 2. Inside view of part of left ramus and teeth of the same mandible.
Fig. 3. Working-surface of the right molars of the same mandible.
Fig. 4. Working-surface of the right mandibular ramus of a larger *Phascolomys gigas.*

PLATE XXXVII.

Fig. 1. Upper view of the lower jaw and teeth, *Phascolomys (Phascolonus) gigas.*
Fig. 2. Anterior fractured surface of right ramus of the same jaw.
Fig. 3. Posterior fractured surface of right ramus of the same jaw.
Fig. 4. Posterior fractured surface of another mandibular ramus, *Phascolomys gigas.*

PLATE XXXVIII.

Fig. 1. Hind view of mandible, *Phascolomys (Phascolonus) gigas.*
Fig. 2. Hind view of mandible, *Phascolomys latifrons.*
Fig. 3. Portion of left mandibular ramus of a large *Phascolomys gigas.*
Fig. 4. Upper surface of the same fossil.
Fig. 5. Portion of left mandibular ramus, *Phascolomys parvus.*
Fig. 6. Upper surface of the same fossil.

PLATE XXXIX.

Fig. 1. Upper surface of fore part of mandible, *Phascolomys gigas.*
Fig. 2. Under surface of the same fossil.
Fig. 3. Back view, showing roots of incisors (i') and anterior molars (d_3) of the same fossil.
Fig. 4. Under surface of fore part of mandible, *Phascolomys vombatus.*

PLATE XL.

Fig. 1. Inner side view of the fore part of a right mandibular ramus and teeth, *Phascolomys gigas.*

Fig. 2. Outer side view of incisor of the same fossil.

Fig. 3. Working-surface of the same incisor.

Fig. 4. Transverse section of the same incisor.

Fig. 5. Outer side view of the same fossil (without reversing).

Fig. 6. Upper view of a portion of the left mandibular ramus and last four molars of a smaller *Phascolomys gigas.*

All the figures are of the natural size: the symbols and letters of reference are explained in the text.

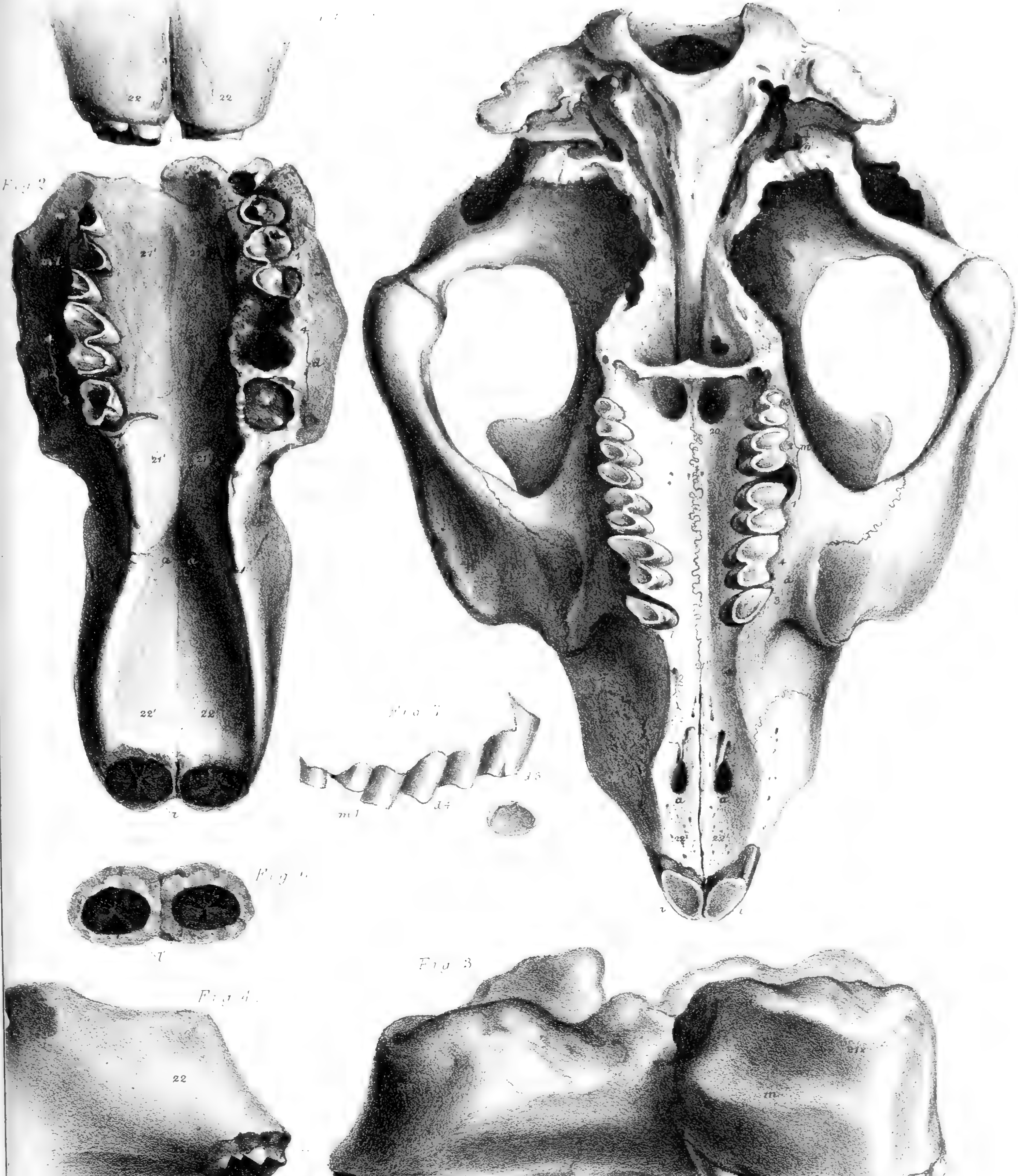
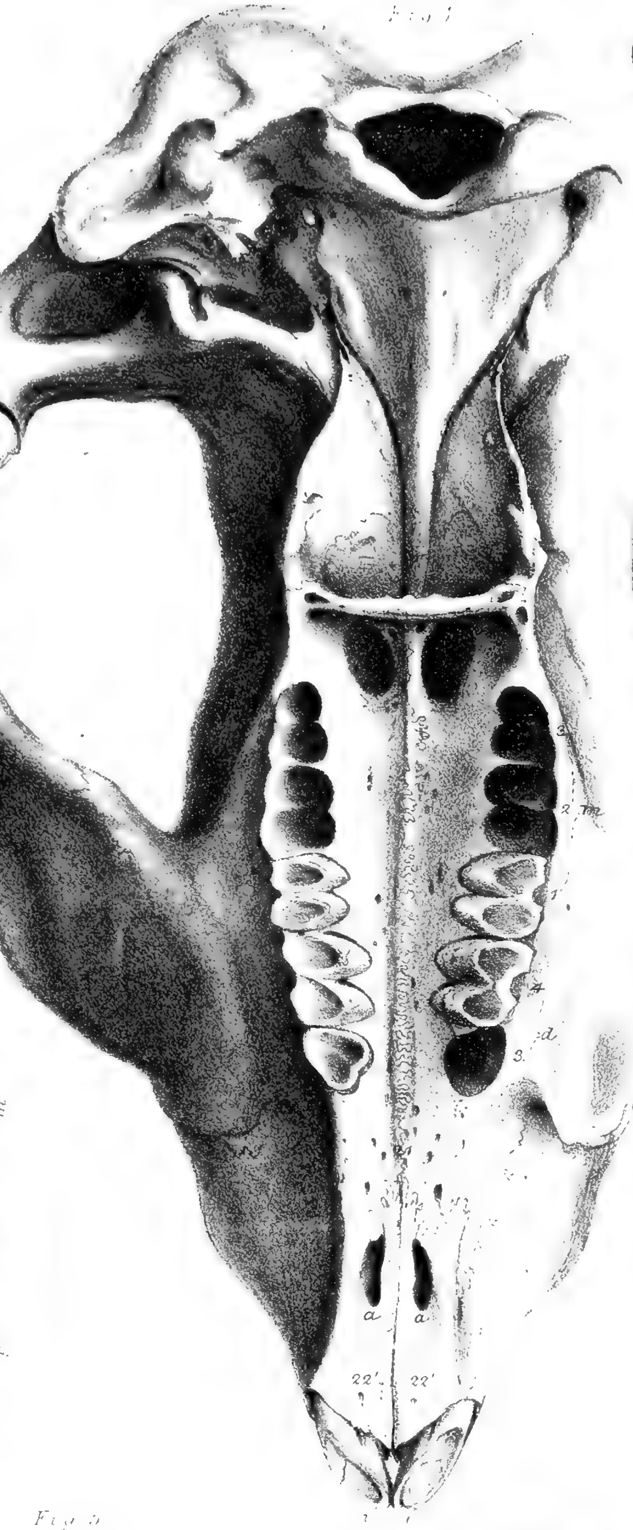
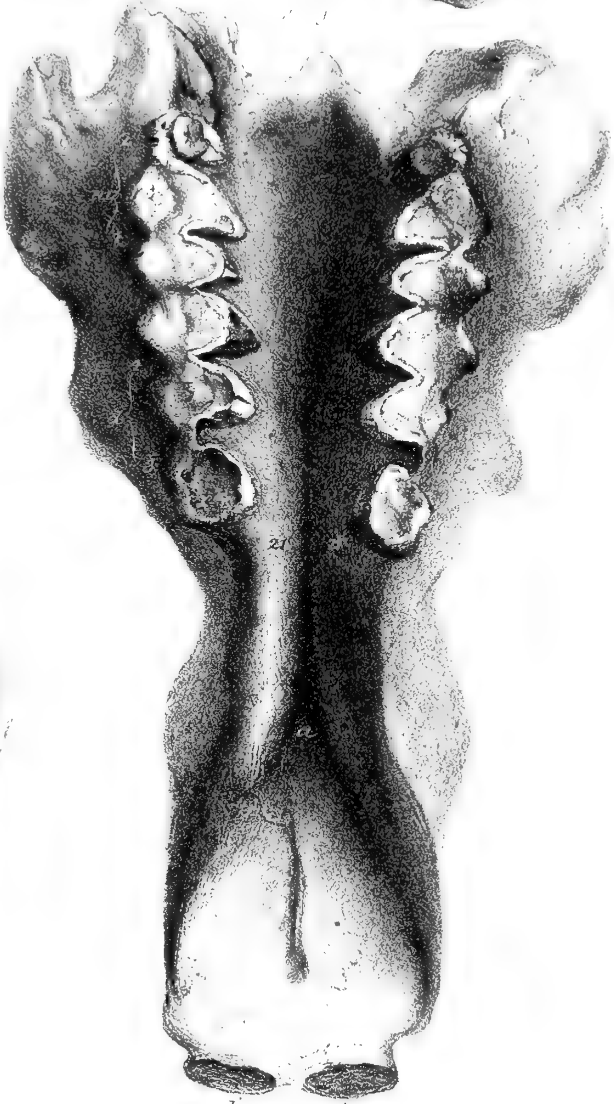
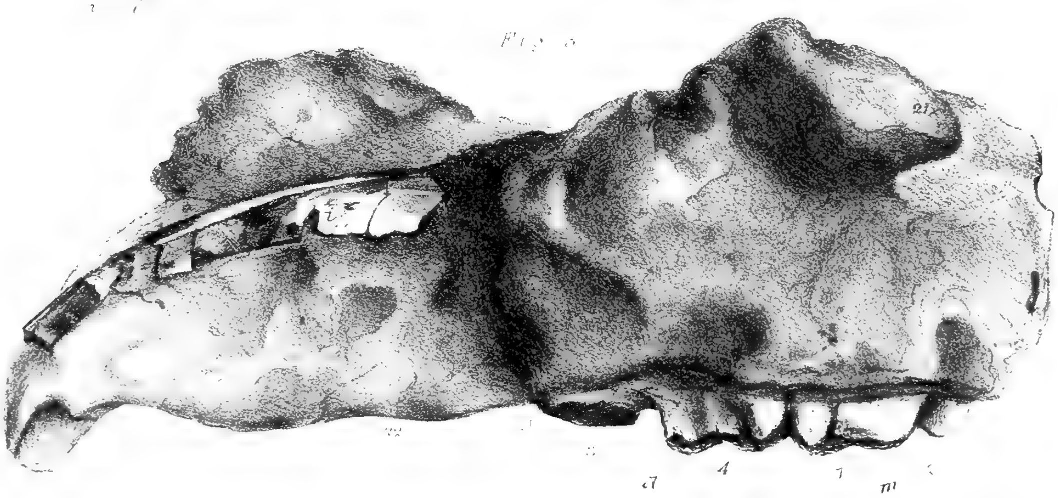
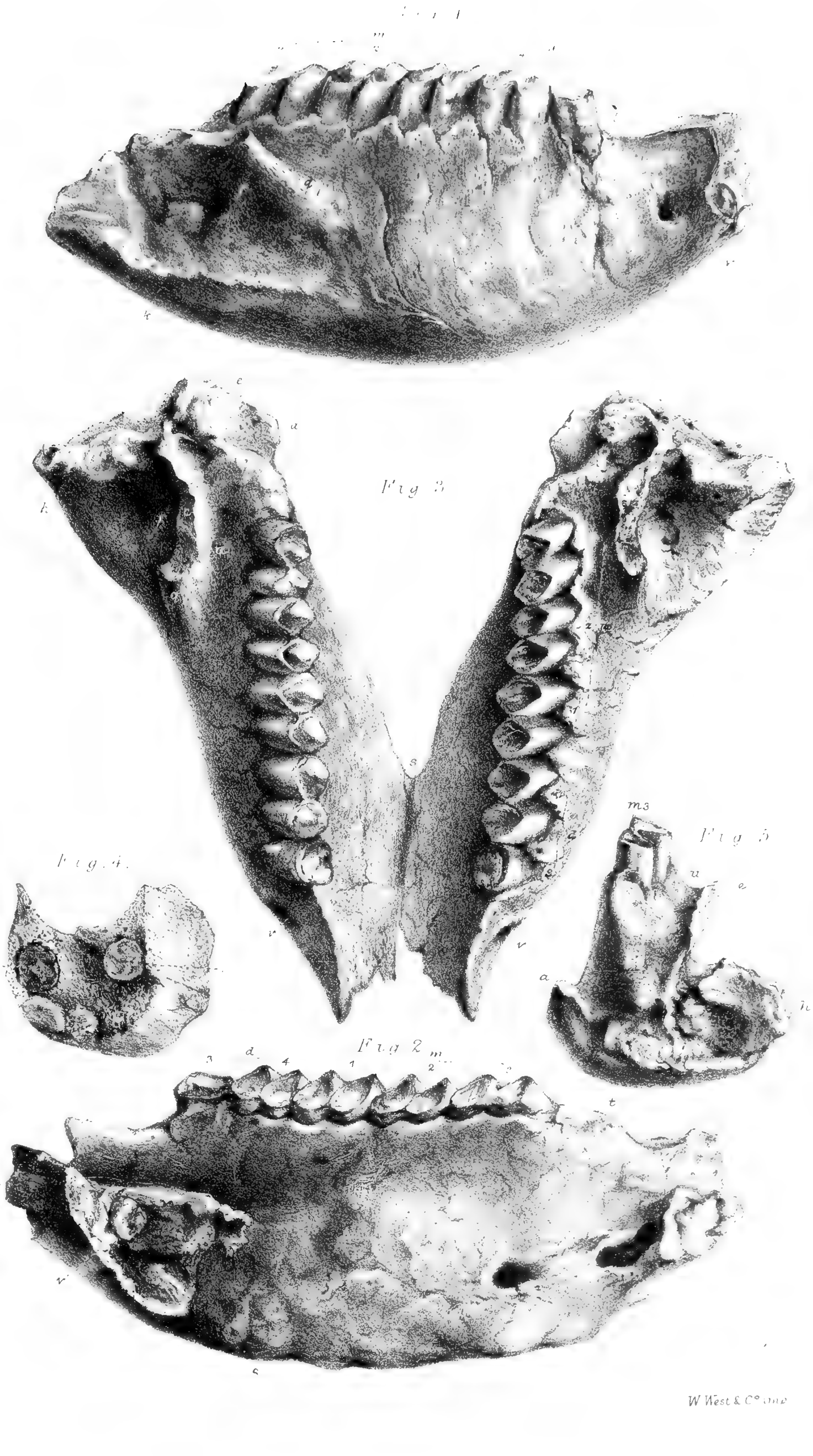


Fig 2
Fig 7
Fig 6
Fig 3
Fig 4
22
21'
22'
m1
14

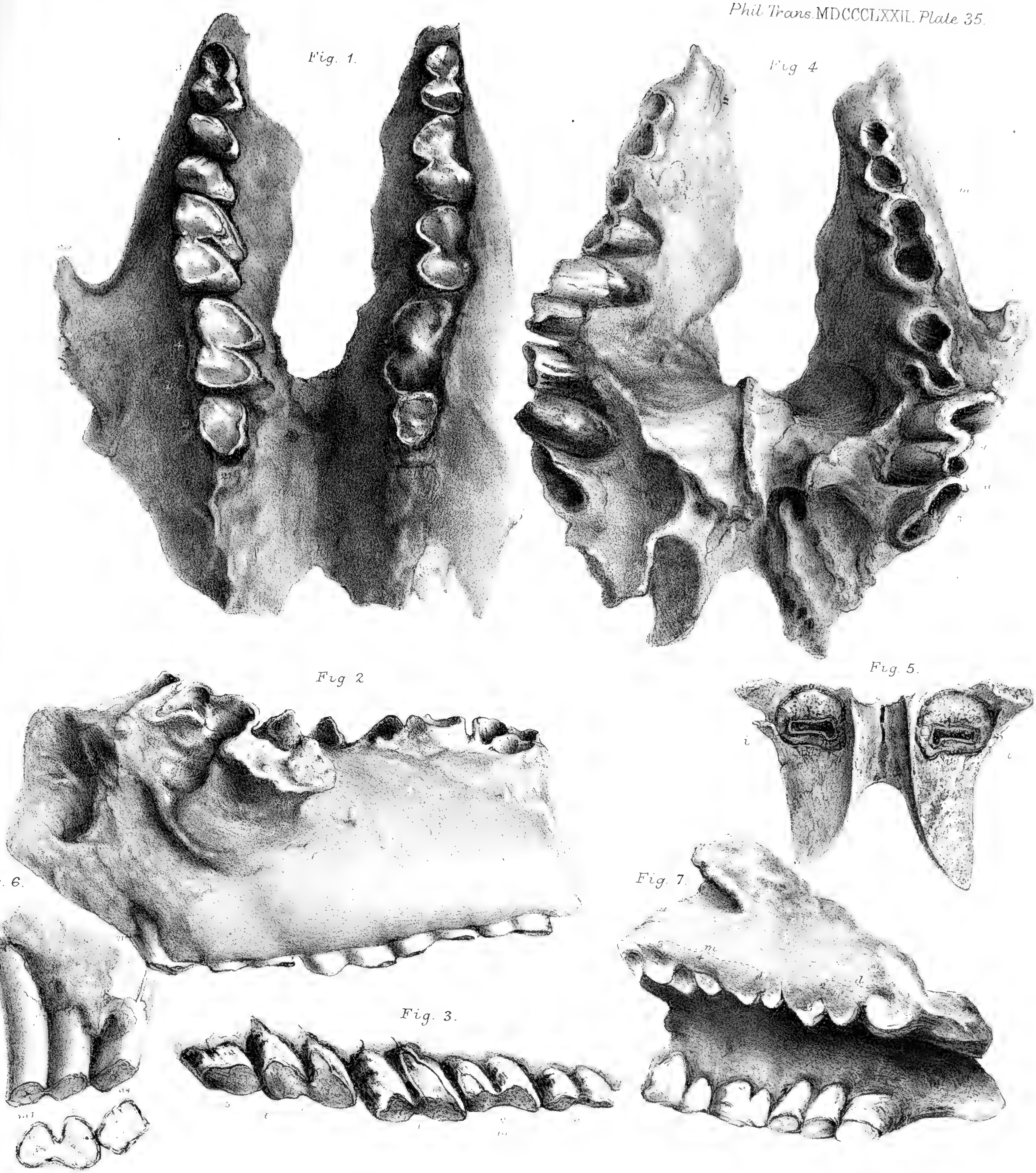

d
3
a
a
22'
22'


21
a

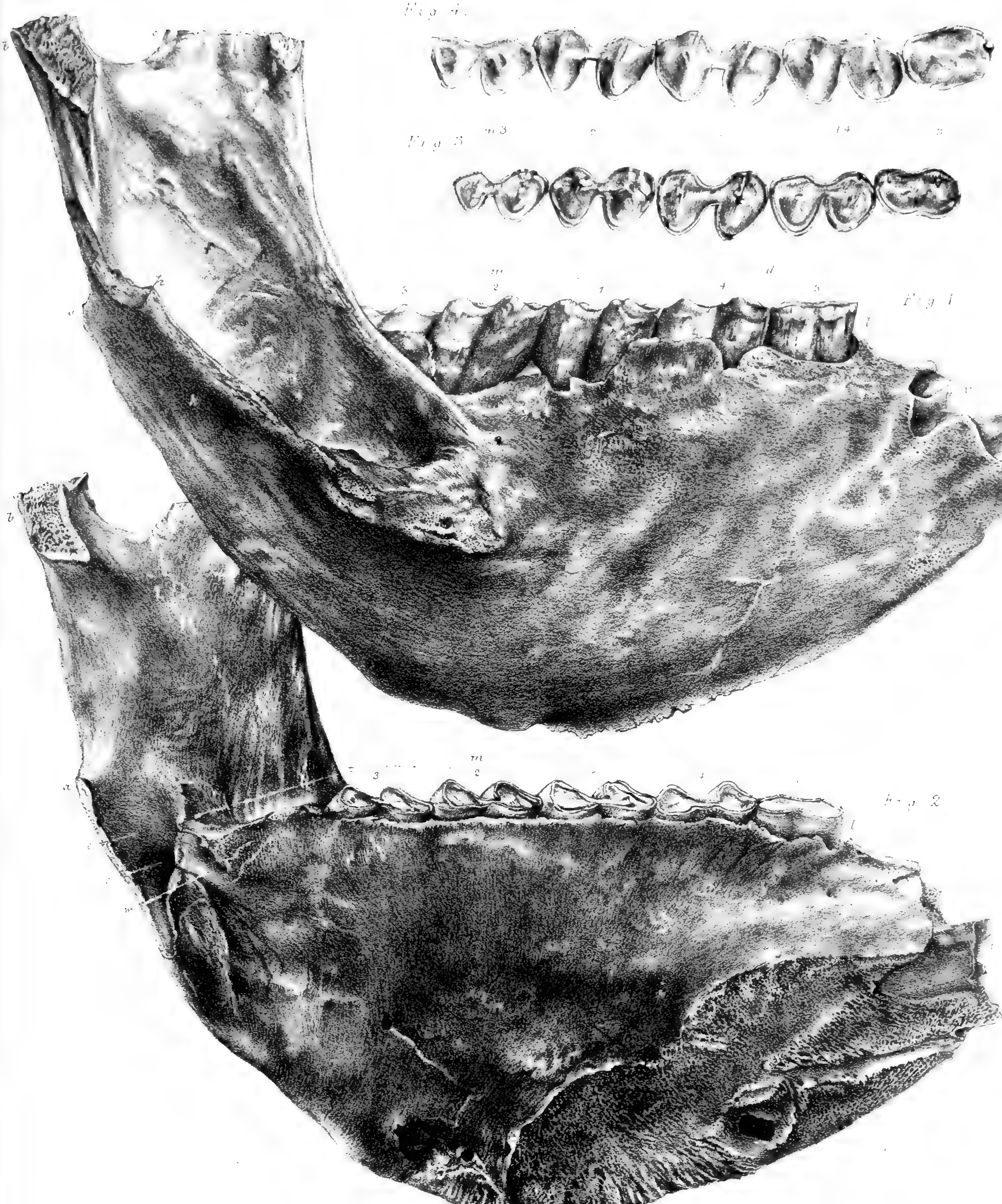

21
d
4
1
m



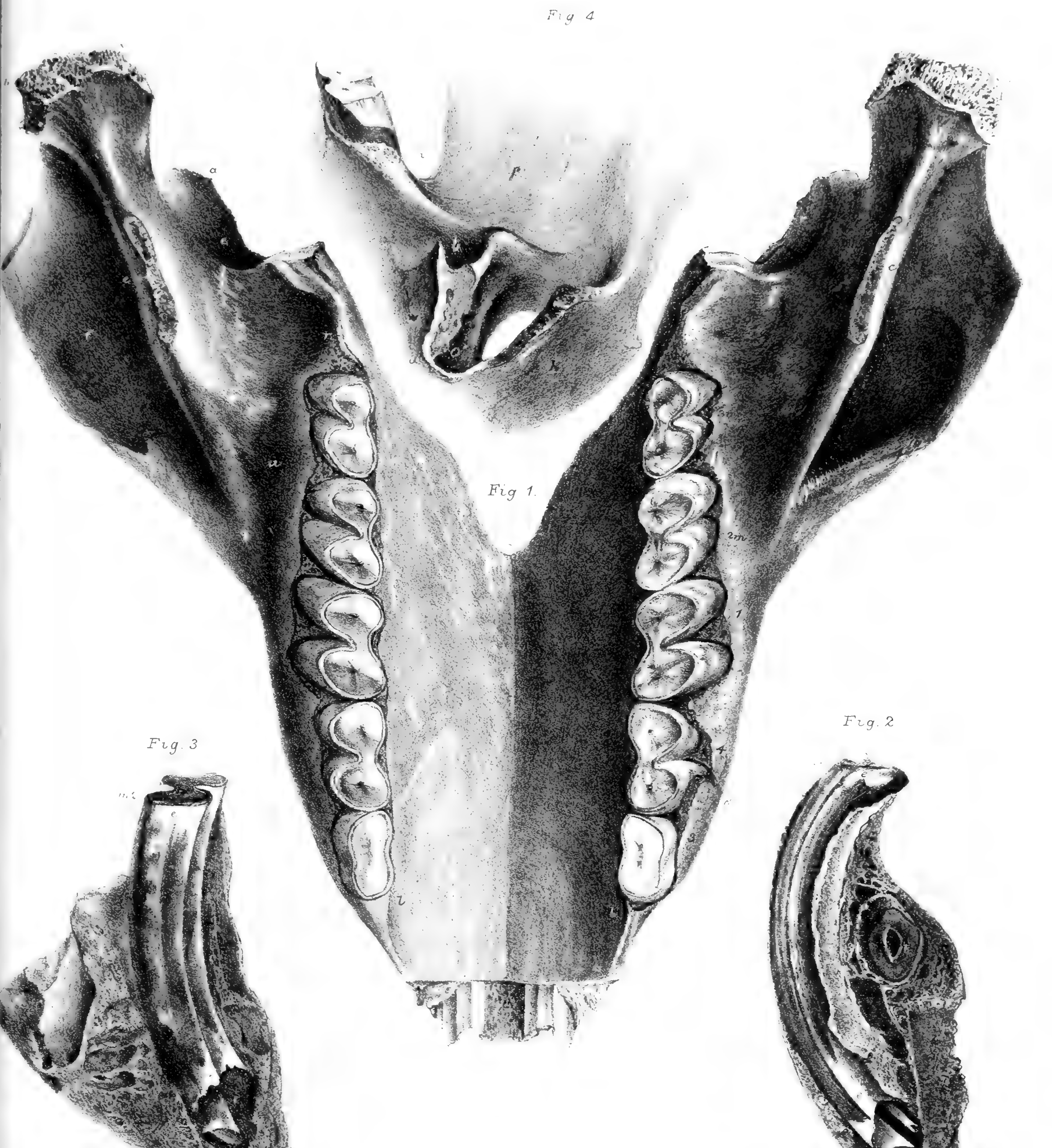
W West & C° imp



W West & C^{o} lith



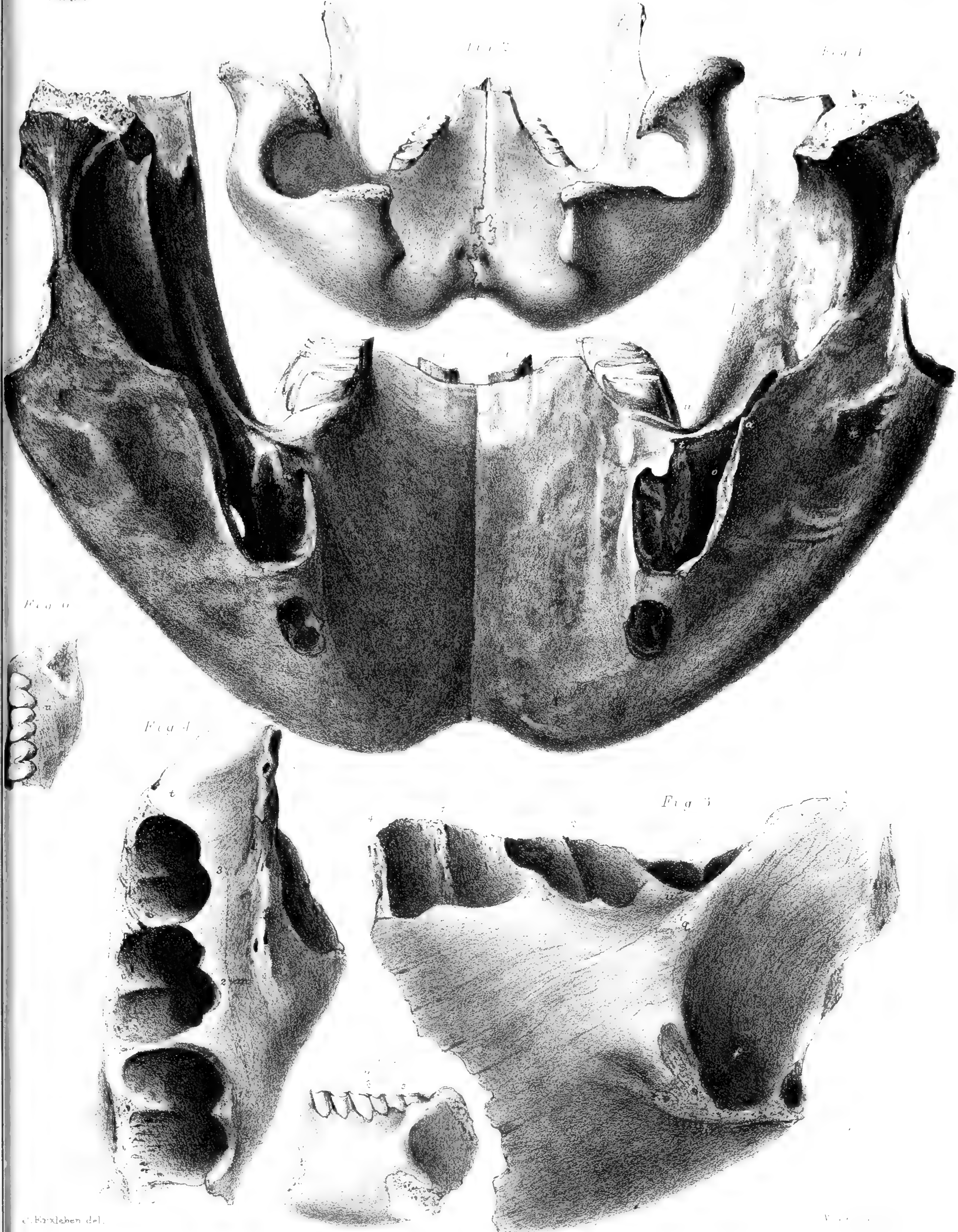
Erxleben del^{t} W West & C^{o} lith



J. Erxleben del

W West & C° lith

Owen



C. Hauxleben del.

Fig. 1

Fig. 2

Fig. 3

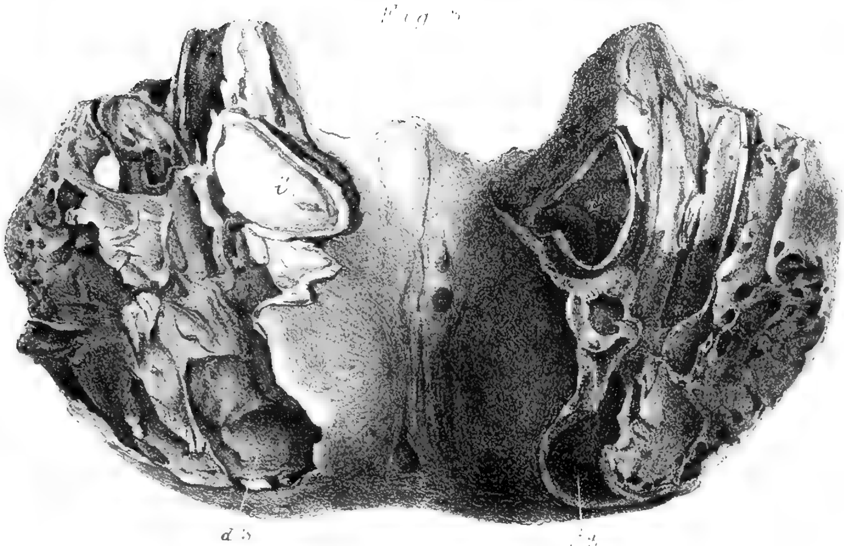
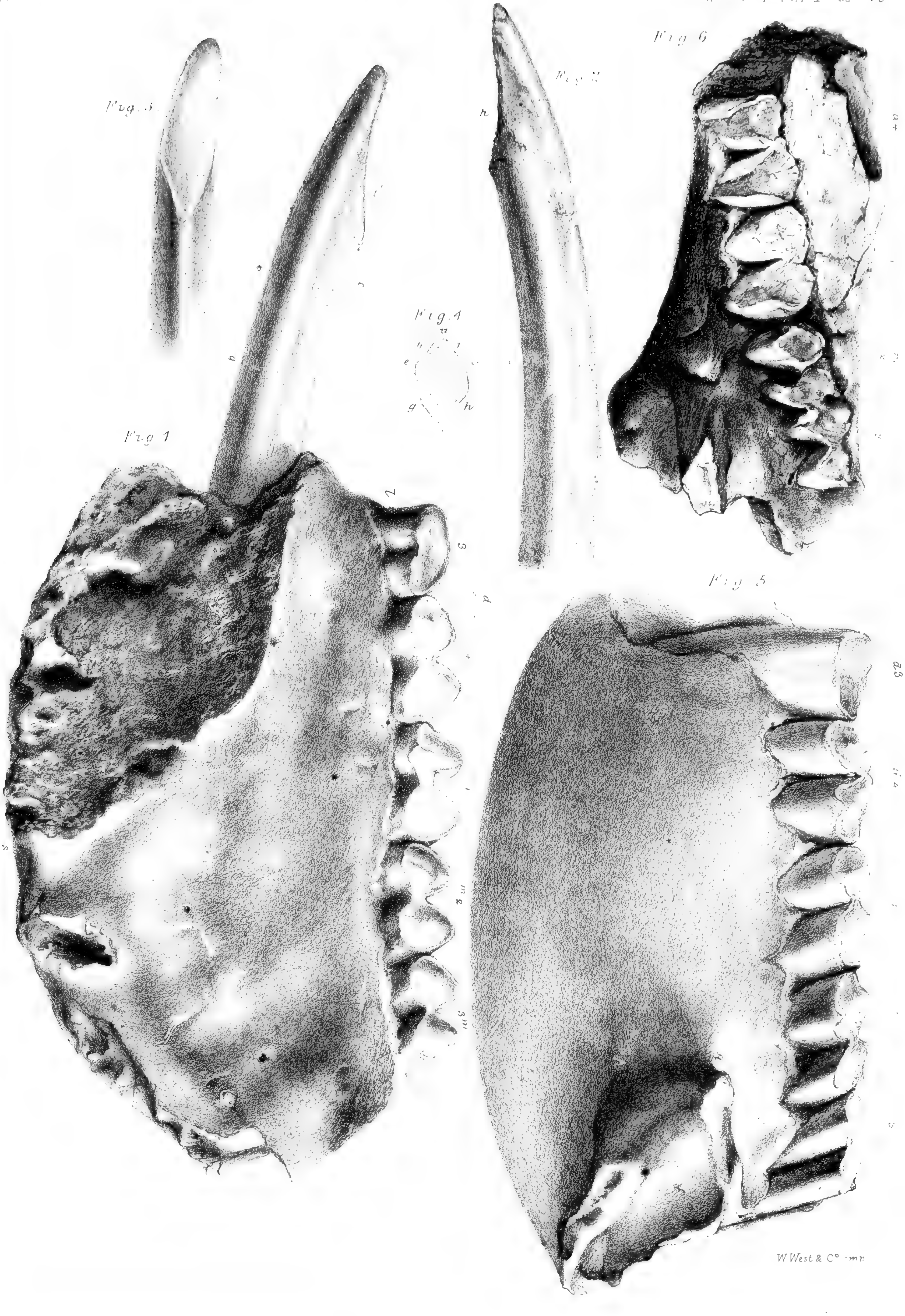


Fig. 4

J. Erxleben del.

W. West & C° lith.



W West & C° imp